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**Asus Eee PC 701 4G** | **XFX GeForce 8600 GT Fatal1ty** | **Sling Media Slingbox SOLO**

# CPU®

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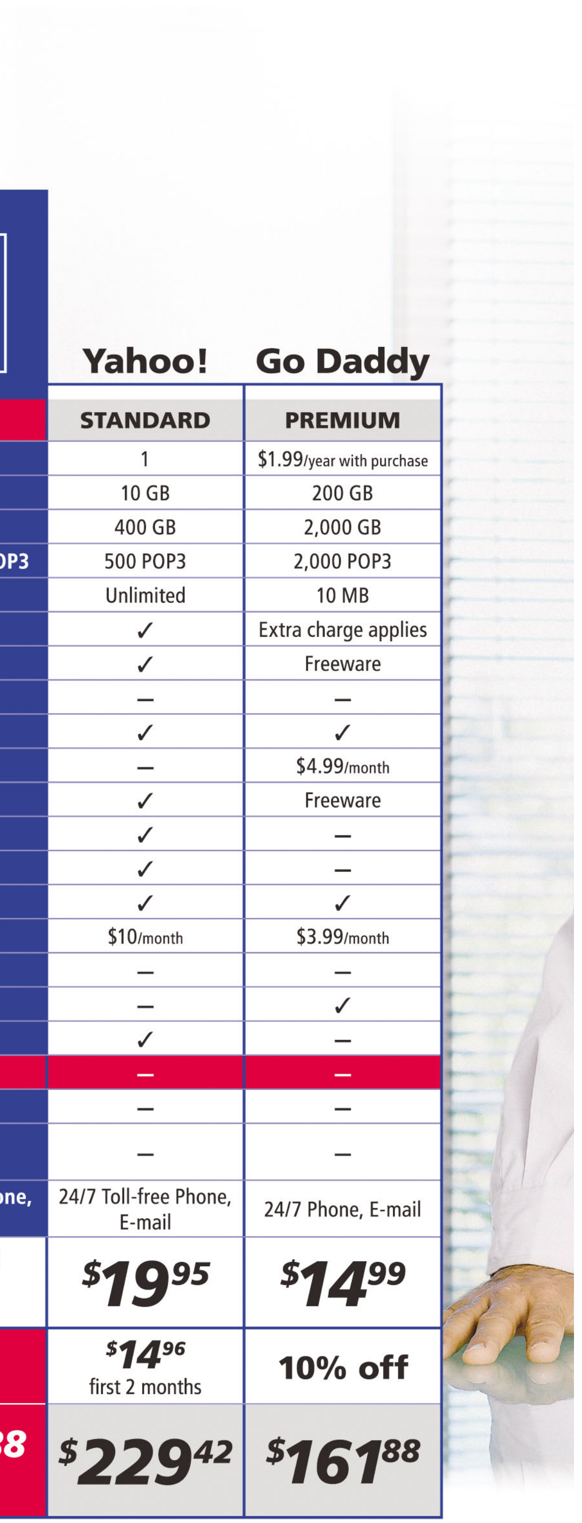

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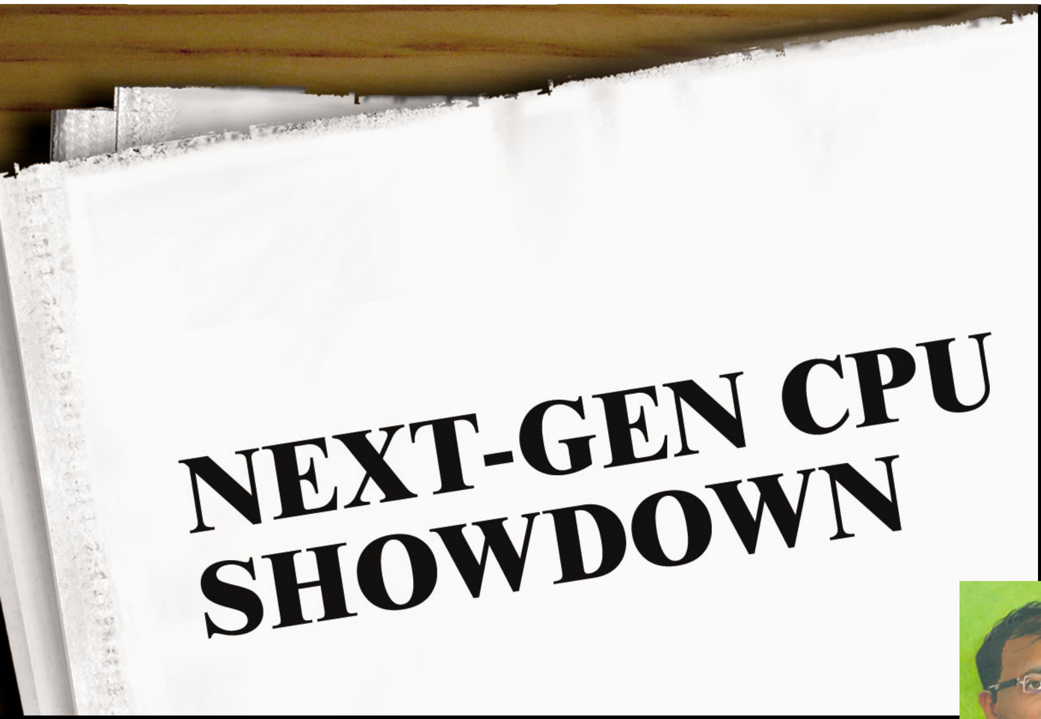

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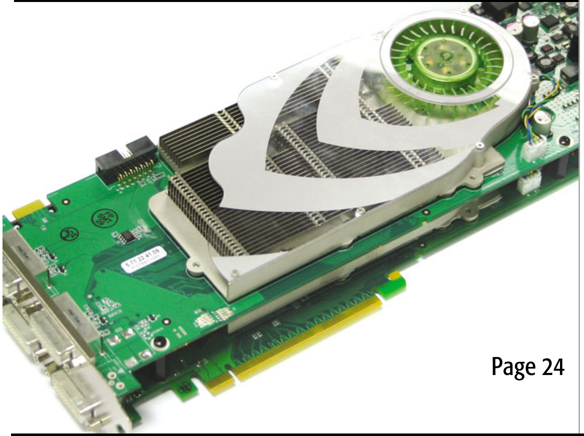

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## Infinite Loops

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# EDITOR'S NOTE

The next big chip offerings from AMD and Intel are finally here, and we couldn't be happier; head to page 56 to see how they run. We also have a number of interesting product reviews for you this month, including our official take on AMD's 5000+ Black Edition (p.33) and a look at Sling Media's SOLO, the latest member of the Slingbox family (p.28).

The SOLO, like all of Sling's products, is very cool, and I like the fact that it goes beyond giving you real-time access to your cable or satellite programming and lets you play stuff from your DVR or DVD player. If you're like me, though, a more compelling gadget is one that lets you take your *PC* and the stuff on *it* with you wherever you go. There are a few ways to skin this cat, as you well know, but I got to thinking about this and decided to try one I haven't looked into for a while.

Have you seen these little portable, external drives that come with pseudo-VM software? Hockey-puck-sized USB/FireWire hard drives are cool enough as it is, but some of these little gems let you install your favorite software to them and then use it on any Windows PC you plug them into. The idea is that you can take *your* Desktop, with all your apps and configs intact, with you wherever you go in a pocket-sized drive and use it without futzing with lengthy installs or worrying about leaving sensitive data behind on computers you borrow or just find lying about.

I contacted the folks at Seagate, who were kind enough to loan me a FreeAgent Go so I could kick the tires. (There are few better jobs for a gadget hound than mine.) I'm impressed; the FreeAgent Go and its attendant software work as advertised. Just plug it into your PC and install your stuff, then unplug it and go. It requires two USB 2.0 ports (one for data and one for data and power), but aside from that you are free to roam. Portable virtualization is hardly a new concept, of course, but my FreeAgent loaner is a 160GB drive, so you're talking about more than simply carrying a browser and an email client around with you. For most people, a 160GB drive is more than sufficient to carry around a full PC install, minus hefty media file archives and such.

When you are done and you unplug the drive, the only traces it leaves behind are a Registry key or two for apps you used. No data files, no passwords, nothing. I would imagine such a device would be indispensable for a World of Warcraft degenerate who doesn't want to cross his company's IT staff by installing the game on a corporate laptop when traveling—although of course I can't say for sure.

**Chris Trumble, Publication Editor, *CPU***

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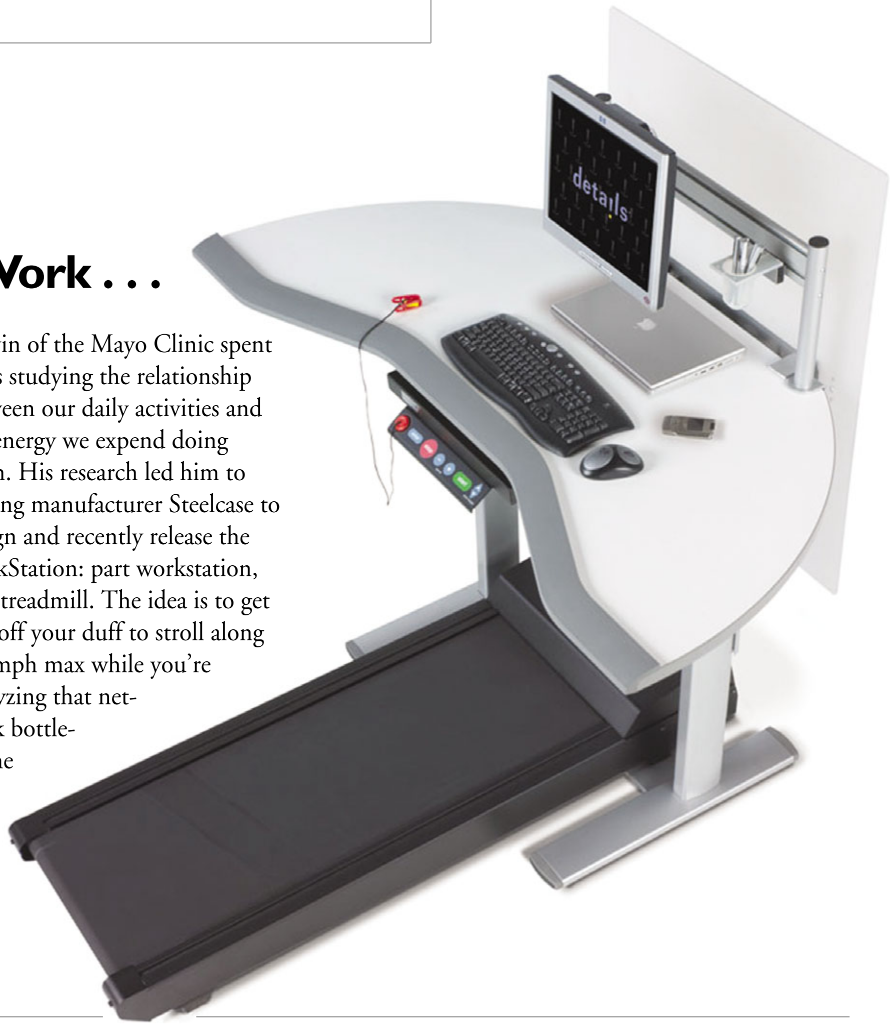
# What's Happening • Hardware

Compiled by Blaine Flamig

## Sony Packs Its Photos In

A candy bar seemingly costs more than a gigabyte of storage these days. Maybe that was the reasoning behind Sony's Cyber-shot DSC-T2. Although the 8MP DSC-T2 has a slot for Memory Stick Duo cards, it's hard to imagine anyone needing it, considering the T2 has 4GB of internal closet space—enough to store about 1,000 shots at 8MP each or about 40,000 VGA images. And if for some reason you keep 40,000 shots around, Sony built in an internal photo album to organize and view them on the DSC-T2's screen. Look for the camera in December for about $350. ▲

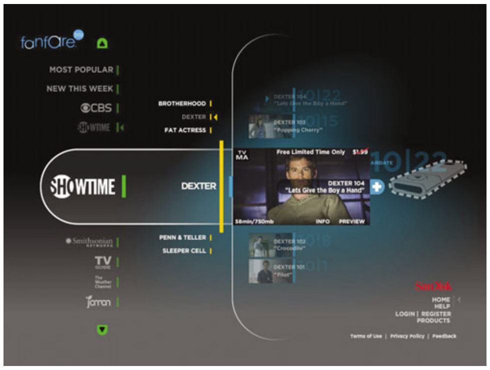
## Forget About Whistling While You Work . . .



Walking is where it's at these days. Dr. James Levin of the Mayo Clinic spent years studying the relationship between our daily activities and the energy we expend doing them. His research led him to joining manufacturer Steelcase to design and recently release the WalkStation: part workstation, part treadmill. The idea is to get you off your duff to stroll along at 3mph max while you're analyzing that network bottleneck. Levin seems to believe his enthusiasm for the WalkStation will be addictive. "I think it's the next iPod. Everybody is going to want one," he stated. Look for the WalkStation via Steelcase's Details ($4,000 to $6,500; www.details-worktools.com) division. ▲

# SanDisk Takes Over The TV

Few companies get more mileage out of the USB port than SanDisk flash drives, MP3 players, card readers, you name it. Now, SanDisk is taking USB to the TV with its TakeTV. The package includes a recorder component with USB connector, cradle with S-Video or composite ports, and remote. Connect the recorder to your PC; drag and drop MPEG-4, DivX, or xVid files to it; stick the recorder in the TV-connected cradle; and you're watching 720 x 576 max video. Networks need not apply. SanDisk also recently launched the Fanfare BETA video download service. Downloads were free to $1.99 at press time with mostly CBS and Showtime content available. 8GB ($149.99; 10 hours video) and 4GB ($99.99; five hours) TakeTVs are available. ▲



# Hardware Mole

## Governors Go Green

Give it up to Minnesota Gov. Tim Pawlenty and Kansas Gov. Kathleen Sebelius. The state leaders announced in early November intentions to buy only computers for governmental offices that meet Energy Star ratings and have more efficient power supplies. Minnesota buys roughly 4,000 computers a year, while Kansas buys 4,500 to 5,000. The governors also declared their states will work to better use sleep and hibernate modes in older PCs in an effort to reduce energy consumption. Pawlenty went so far as to say he hopes his state can cut computer-related power consumption by 50% in four years. "The cleanest and cheapest energy is the energy we don't use," he said. "If all states adopt these approaches, the combined impact would be very substantial." ▲

## HD DVD Pricing Sinks To A New Low

Even before Thanksgiving had passed, Wal-Mart was sprinkling on the Christmas spirit by dropping the price on Toshiba's HD DVD HD-A2 player from nearly $200 to $98. Best Buy soon followed suit, reportedly selling its HD-A2 supply out in a jiffy. Wal-Mart's "special" one-day HD-A2 sale was widely viewed as an effort to empty inventory before Black Friday to make room for the newer and more expensive HD-A3, which should carry a still-friendly sub-$200 price. At the least, the moves paid off for Toshiba, which reportedly sold about 90,000 players in one weekend. ▲

## Long Live The PC

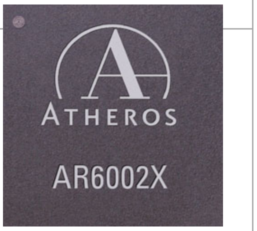
According to recent numbers from IDC and Gartner, the PC is doing just fine, thank you. Bolstered in large part by portable PC sales, IDC cited 66.9 million global shipments of PCs for Q3, nearly 9 million over the same period last year. Gartner cited shipments of 68.5 million, up from 59.8 million over Q3 2006. Data from the analyst firms also puts HP (19.6%, IDC; 18.8%, Gartner) still above Dell (15.2% IDC; 14.4% Gartner) as the leader among manufacturers, although Dell is still the leader in U.S. sales. Bringing up the global pack are Lenovo, Acer, and Toshiba. ▲

Compiled by Dean Takahashi

## DS2 Introduces 400Mbps Data Transfer Over Electrical Wires

Home networks will soon be able to transfer data at a rate of 400Mbps over the electrical wires of a home, according to DS2, a chip maker based in Valencia, Spain. The company says that its next-generation technology will be double the speed of its current 200Mbps power line chips, which use signal processing technology to send Internet data over electrical wiring. That speed will be enough to enable new high-definition multimedia applications, such as multiple-channel delivery of HD-IPTV signals from one room in a house to another. Other applications include networked digital video recorders and the ability to transfer five video streams at the same time over a single electrical wire. The company did not say exactly when it will deliver the chips, but it has demonstrations of the technology working. The Diffusion Group estimates that home networks will need to transfer at least three HDTV and two SDTV video streams inside the home as early as 2009. ▲

## Atheros Makes Very Low-Power Wi-Fi Chips To Enable Smallest Devices



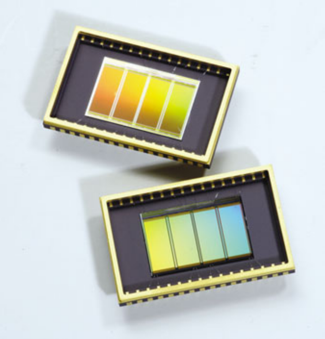
Power consumption has been one of the big hold-ups for putting Wi-Fi wireless networking into a wide range of mobile devices. But Atheros Communications hopes to change that with its new Atheros AR6002 family of Wi-Fi chips. Atheros says the AR6002 family uses 70% less power than the best chips on the market today. The company says a device could download 200GB of data before depleting a 3.7-volt battery in a gadget that uses the AR6002. That means that gadget designers may start putting Wi-Fi into more smartphones, personal media players, digital still cameras, gaming handhelds, and other devices. The company will ship several versions of the chips using different versions of Wi-Fi in the first quarter of 2008. ▲

## Watching The Chips Fall

Here is pricing information for AMD and Intel CPUs.

*Retail price
** Manufacturer's price per 1,000 units
Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com

| CPU | Released | Original price | Last month's price | Current price |
|---|---|---|---|---|
| AMD Turion TL-56 1.8GHz 1MB cache 1,600MHz HyperTransport bus | 5/3/2007 | $184** | $159 | $189* |
| AMD Turion TL-60 2GHz 1MB cache 1,600MHz HyperTransport bus | 5/3/2007 | $220** | $251 | $251 |
| AMD Turion TL-64 2.2GHz 1MB cache 1,600MHz HyperTransport bus | 5/3/2007 | $354** | $257 | $251 |
| AMD Athlon 64 X2 Dual-Core 5600+ AM2 only | 12/12/2006 | $505** | $137 | $139 |
| AMD Athlon 64 X2 Dual-Core 6000+ AM2 only | 2/20/2007 | $464** | $157 | $163 |
| AMD Athlon 64 X2 Dual-Core 6400+ AM2 only | 8/20/2007 | $251** | $209 | $228 |
| AMD Athlon 64 FX-70 | 11/30/2006 | $599/pair | $364 | $323 |
| AMD Athlon 64 FX-72 | 11/30/2006 | $799/pair | $316 | $280 |
| AMD Athlon 64 FX-74 | 11/30/2006 | $999/pair | $274 | $307 |
| Intel Core 2 Duo Mobile T7100 1.8GHz 4MB cache 800MHz FSB | 5/9/2007 | $209** | $214 | $212 |
| Intel Core 2 Duo Mobile T7300 2GHz 4MB cache 800MHz FSB | 5/9/2007 | $241** | $251 | $249 |
| Intel Core 2 Duo Mobile T7500 2.2GHz 4MB cache 800MHz FSB | 5/9/2007 | $316** | $252 | $339 |
| Intel Core 2 Duo Mobile T7700 2.4GHz 4MB cache 800MHz FSB | 5/9/2007 | $530** | $322 | $538 |
| Intel Core 2 Extreme Mobile X7800 | 7/16/2007 | $851** | $851** | $851** |
| Intel Core 2 Duo E6540 | 7/16/2007 | $163** | $256 | $160 |
| Intel Core 2 Duo E6550 | 7/16/2007 | $163** | $169 | $168 |
| Intel Core 2 Duo E6600 2.4GHz 4MB cache 1,066MHz FSB 65nm | 7/27/2006 | $316** | $204 | $204 |
| Intel Core 2 Duo E6700 2.66GHz 4MB cache 1,066MHz FSB 65nm | 7/27/2006 | $530** | $309 | $279 |
| Intel Core 2 Duo E6750 | 7/16/2007 | $183** | $193 | $216 |
| Intel Core 2 Duo E6850 | 7/16/2007 | $266** | $271 | $273 |
| Intel Core 2 Duo X6800 2.93GHz 4MB cache 1,066MHz FSB 65nm | 7/27/2006 | $999** | $994 | $843 |
| Intel Core 2 Quad Q6600 | 1/8/2007 | $851** | $269 | $271 |
| Intel Core 2 Quad Q6700 | 7/16/2007 | $530** | $534 | $529 |
| Intel Core 2 Extreme QX6700 | 11/14/2006 | $999** | $778 | $712 |
| Intel Core 2 Extreme QX6800 | 7/16/2007 | $999** | $944 | $829 |
| Intel Core 2 Extreme QX6850 3GHz 8MB cache 1,333MHz FSB 65nm | 7/16/2007 | $999** | $944 | $1,035 |



## Samsung Unveils First 30nm Flash Memory Chips

Don't worry about whether the iPods of the future will have enough storage to keep up with your mobile entertainment needs. Samsung said it has fabricated the world's first 30nm 64GB NAND flash memory chips. A set of 16 such chips could be used to make a 128GB flash memory storage card. That's enough storage for 80 DVD-resolution movies or 32,000 MP3 music files, the company said. The chip depends on manufacturing technology that can create circuits on chips with a width of just 30nm. It was only seven years ago that Samsung made its first 1GB NAND chip with a 100nm manufacturing technology. Samsung said it used a new process called "self-aligned double patterning technology," which it called a pivotal advance beyond the charge trap flash that Samsung developed for NAND flash last year when it introduced a new material, silicon nitride, in the chip-making process. Samsung expects to begin shipping the chips in 2009, and it has applied for 30 patents on it. ▲

# What's Happening • Internet

Compiled by Blaine Flamig

## Farewell, Vint Cerf, You Served ICANN Well

You aren't seated at the front of ICANN's table without owning serious chops. Even so, newly elected chairman Peter Dengate Thrush has sizable shoes to fill considering his predecessor is *the* Vint Cerf. Beyond helping kickstart this whacky thing we call the Internet back in the 1970s with his TCP/IP work, Cerf joined ICANN's board in 1999, serving as its chairman since 2000 before stepping away in late October due to term limitations. You can still catch Cerf's act, however, as Google's "chief Internet evangelist" and as the author of five upcoming books he plans to now finish. Unfortunately for geeks, only one book reportedly focuses on the Internet. ▲

## Rep. Ron Paul, We Salute You

You're forgiven if you didn't have Clue 1 who Ron Paul was prior to Nov. 5. Despite being a 2008 Presidential hopeful and the only Republican candidate on record to oppose the Iraq war, Paul wasn't exactly a household name. Post-Nov. 5, though, the Texas congressman was a record-breaking online fundraiser with a bit more clout. Political preference aside, any self-respecting political junkie has to appreciate Paul's efforts at raking in a reported $4.2 million and change in Web donations from nearly 37,000 donors in a mere 24 hours. So prolific was Paul's online effort, he nearly equaled in one day the funds his campaign raised from July to September. ▲

## U.S. Adults Do The Internet Dance

A recent Harris Poll survey of 2,000-plus U.S. adults indicates four of five U.S. adults (79% or 178 million) are now online. That's up from 77% in 2006, 57% in 2000, and 9% in 1995. Arguably more interesting is that 31% of those polled report they're hopping online somewhere other than home or work. That's up from 22% last year. Also interesting is that adult Internet usage numbers are steadily moving closer to actual population numbers. For example, 25% of adults online fall in the 18 to 29 age group, which accounts for 22% of the U.S. adult population. Additionally, 9% of U.S. online adults polled were 65 years and older, an age group that makes up 16% of the U.S. adult population. ▲

## Site Seeing

### Say It Isn't So, Mom

Remember the creepy "this is way more information than I need" vibe you got the first time you saw the often tragic postcard confessionals at PostSecret.com? The same vibe awaits you at True Mom Confessions (truemomconfessions.com), where mothers have a forum to anonymously vent, praise, plead, rant, swoon, and swear on all things motherhood, including kids, husbands, and in-laws. Mothers might take comfort in reading comments they might have felt themselves but kept bottled up ("I love my children, but most times, I feel like I should be doing something else with my life"), but husbands, be warned: We don't come so well. Suppose a batch of chocolate chip cookies is out of the question? ▲

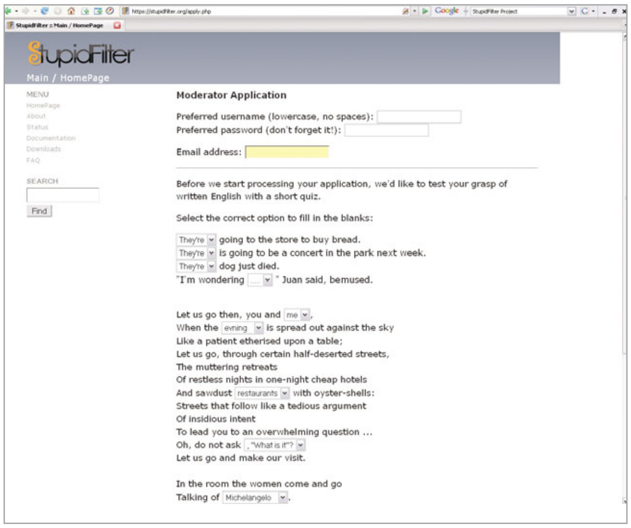
### A Spacey Media Player

Stargazers, rejoice. Although still in beta at press time, AMP (Astronomy Media Player; www.jodcast.net/amp/about.html) is your gateway to global video and audio podcasts on all matters astronomy. As the site says, AMP is geared to "make it easier for everyone to find the astronomy multimedia resources that are out there and perhaps be entertained at the same time." AMP does this ably by gathering dozens of sources—*Astronomy Magazine*, Science @ NASA, the lovable Jack Horkheimer of "Star Gazer," etc.—and neatly organizing them into General, Observing, Courses, Your Questions, Observatories, and Top Ten tabs. Let the naked-eye gazing commence. ▲

Compiled by Blaine Flamig

## Attenntion Stuppid Peeple, Ur Time Is Overr

“Too long have we suffered in silence under the tyranny of idiocy.” So say Gabriel Ortiz and Paul Starr, the creators of the StupidFilter Project, which aims to create a free, open-source, spam-like filter to “detect rampant stupidity in written English.” You know, the kind of unintelligible user babble that’s prevalent at YouTube or the rampant misspellings, double consonant use, and nonsensical meanderings on nearly every message board. Project documentation indicates we can expect core engine source code eventually for content management systems, wikis, blogs, etc., plus Firefox and WordPress plug-ins. (An alpha release was set for December.) Go to Stupidfilter.org to help the cause. If you want to be a moderator, you’ll need to get your Prufrock on. ▲



**Moderator Application**

Preferred username (lowercase, no spaces):
Preferred password (don't forget it!):
Email address:

Before we start processing your application, we'd like to test your grasp of written English with a short quiz.

Select the correct option to fill in the blanks:

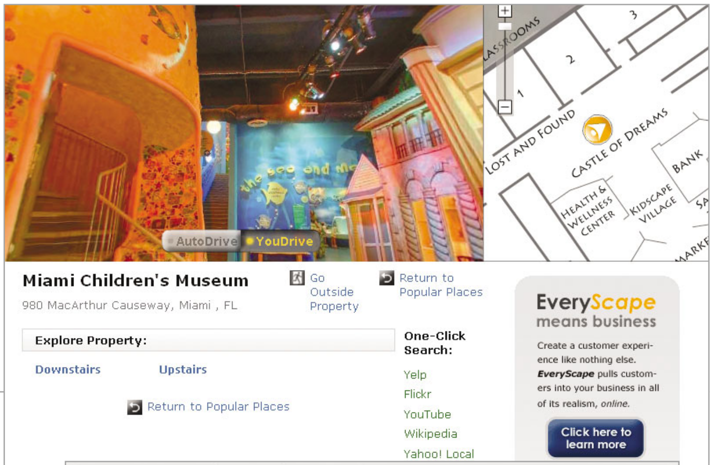
They're going to the store to buy bread.
They're is going to be a concert in the park next week.
They're dog just died.
"I'm wondering ... " Juan said, bemused.

Let us go then, you and me,
When the evning is spread out against the sky
Like a patient etherised upon a table;
Let us go, through certain half-deserted streets,
The muttering retreats
Of restless nights in one-night cheap hotels
And sawdust restaurants with oyster-shells:
Streets that follow like a tedious argument
Of insidious intent
To lead you to an overwhelming question ...
Oh, do not ask , "What is it"?
Let us go and make our visit.

In the room the women come and go
Talking of Michelangelo.

## The World Awaits You Online

“EveryScape isn’t an online world, *it’s the world online*.” That’s the mantra of EveryScape, a 3D search engine that’s still in beta but nonetheless very cool. Think Google’s Street View but with the added luxury of stepping off city streets into actual buildings, hotels, and other edifices. Although EveryScape is now limited to Boston, New York City, Miami, and Aspen destinations, there’s plenty to experience to get an idea of the engine’s potential. Whether you drop in at the Rio Grande Skatepark in Aspen, Colo., or step into Miami’s Children’s Museum, we can’t imagine you’ll be disappointed with what you find. ▲



**Miami Children's Museum**
980 MacArthur Causeway, Miami , FL

Create a customer experience like nothing else. ***EveryScape*** pulls customers into your business in all of its realism, *online*.

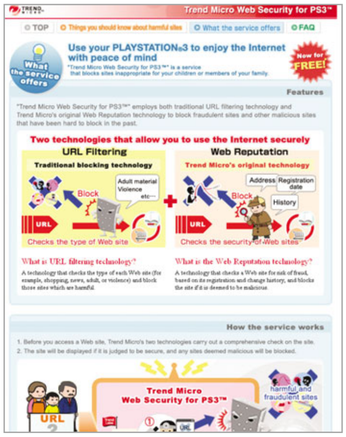
## Leopard’s Spots Spread Crazy-Fast

Despite grumblings about Time Machine, a nasty data-loss bug, firewall roadblocks, and problematic upgrades and installations, Apple stated it “sold (or delivered in the case of maintenance agreements) more than 2 million copies of Leopard” by Oct. 30—this after releasing it just four days prior. As expected, not everyone now using Leopard paid for it. As Ars Technica discovered via some investigative reporting, Leopard was ripe for the picking at BitTorrent even before the OS’ official release. Upon questioning those who snatched up a pirated copy, one user replied, “BitTorrent delivers faster than FedEx, dude.” Hard to argue with that logic. ▲

# Software Shorts

## Trend Micro Goes Gaming

If you can put down your PS3 controller long enough, Trend Micro is now offering Web Security For PS3, which it describes as a "total Web security service combining URL filtering and Web reputation" technology. The service is free at Sony through April via a firmware update (2.00 at press time), though you may have to pay down the road. Users can block sites that sport Alcohol/Tobacco, Gambling, Crime, and other characteristics. Checks are run against Trend Micro's database of nasties and who owns and hosts the sites that house them. ▲


TREND MICRO
Trend Micro Web Security for PS3™
TOP
Things you should know about harmful sites
What the service offers
FAQ
What the service offers
Now for FREE!
Features
URL Filtering
Traditional blocking technology
Web Reputation
Trend Micro's original technology
Adult material
Violence
etc…
Block
URL
Checks the type of Web site
Address
Registration date
History
Block
URL
Checks the security of Web sites
How the service works
Trend Micro Web Security for PS3™
URL
harmful and fraudulent sites

Use your PLAYSTATION®3 to enjoy the Internet with peace of mind

"Trend Micro Web Security for PS3™" is a service that blocks sites inappropriate for your children or members of your family.

"Trend Micro Web Security for PS3™" employs both traditional URL filtering technology and Trend Micro's original Web Reputation technology to block fraudulent sites and other malicious sites that have been hard to block in the past.

Two technologies that allow you to use the Internet securely

What is URL filtering technology?

A technology that checks the type of each Web site (for example, shopping, news, adult, or violence) and block those sites which are harmful.

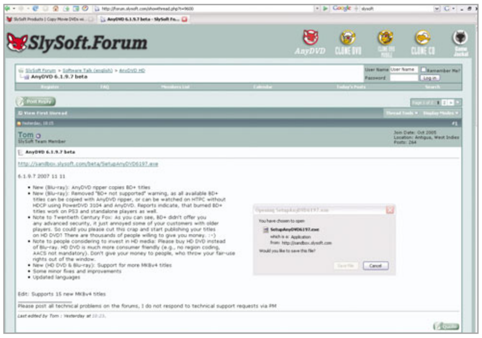
What is the Web Reputation technology?

A technology that checks a Web site for risk of fraud, based on its registration and change history, and blocks the site if it is deemed to be malicious.

1. Before you access a Web site, Trend Micro's two technologies carry out a comprehensive check on the site.
2. The site will be displayed if it is judged to be secure, and any sites deemed malicious will be blocked.

## SlySoft Bring BD+ To Its Knees

It wasn't enough that SlySoft released a beta version of its AnyDVD HD software in early November that will crack the "unbreakable" BD+ protection on Blu-ray discs, but the company also took a shot at Twentieth Century Fox and put in a plug for HD DVD at the same time. To Fox, SlySoft team member "Tom" wrote: "As you can see, BD+ didn't offer you any advanced security, it just annoyed some of your customers with older players. So could you please cut this crap and start publishing your titles on HD DVD? There are thousands of people willing to give you money." Ouch. Reports indicate SlySoft doesn't plan to release the crack into the wild. ▲



Join Date: Oct 2005
Location: Antigua, West Indies
Posts: 264

AnyDVD 6.1.9.7 beta

http://sandbox.slysoft.com/beta/SetupAnyDVD6197.exe

6.1.9.7 2007 11 11

- New (Blu-ray): AnyDVD ripper copies BD+ titles
- New (Blu-ray): Removed "BD+ not supported" warning, as all available BD+ titles can be copied with AnyDVD ripper, or can be watched on HTPC without HDCP using PowerDVD 3104 and AnyDVD. Reports indicate, that burned BD+ titles work on PS3 and standalone players as well.
- Note to Twentieth Century Fox: As you can see, BD+ didn't offer you any advanced security, it just annoyed some of your customers with older players. So could you please cut this crap and start publishing your titles on HD DVD! There are thousands of people willing to give you money. :-)
- Note to people considering to invest in HD media: Please buy HD DVD instead of Blu-ray. HD DVD is much more consumer friendly (e.g., no region coding, AACS not mandatory). Don't give your money to people, who throw your fair-use rights out of the window.
- New (HD DVD & Blu-ray): Support for more MKBv4 titles
- Some minor fixes and improvements
- Updated languages

Edit: Supports 15 new MKBv4 titles

Please post all technical problems on the forums, I do not respond to technical support requests via PM

Last edited by Tom : Yesterday at 10:23.

You have chosen to open

SetupAnyDVD6197.exe

which is a: Application

from: http://sandbox.slysoft.com

Would you like to save this file?

## Phoenix Sends Computing Into HyperSpace

Windows, who needs it? Well, we'll need it a lot less if BIOS maker Phoenix can deliver with HyperSpace. In addition to lowering battery consumption, HyperSpace would give laptop users instant-on access to embedded apps that could run outside of Windows. That means we could jump right into watching "Casino Royale" or browsing to Digg without waiting on Windows' slow self. According to Phoenix CEO Woody Hobbs, "HyperSpace introduces a new framework to transform the personal computing experience through purpose-driven appliances that work within the HyperSpace environment." Powering HyperSpace is HyperCore, an embedded Zoned Virtual Machine Monitor that runs specific core services alongside Windows. Expect notebooks with HyperSpace within six months or so.

## BIOS Upgrades Available Online

**Compiled by Steve Smith**

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new lease on life. Here are a few recently released upgrades. Readers can check out www.cpumag.com/cpujan08/bios to see our entire upgrade list.

| Motherboard | Date Available | URL |
|---|---|---|
| Manufacturer | Date | Location |
| Abit Fatal1ty FP-IN9 SLI 15 | 8/14/07 | ftp://ftp-usa.abit.com.tw/pub/download/bios/fpin9sli//m624b15.zip |
| ASRock 775Dual-880Pro 1.7 | 10/08/07 | www.asrock.com/mb/from.asp?Model=775Dual-880Pro&T=B&ID=1366 |
| ECS GeForce6100SM-M2 07/10/23 | 10/24/07 | www.ecs.com.tw/ECSWebSite/Downloads/DownloadFile.aspx?catid=1&driverid=3909&areaid=2&LanID=9 |
| Gigabyte GA-M61PM-S2 F8 | 10/05/07 | america.giga-byte.com/FileList/BIOS/motherboard_bios_ga-m61pm-s2_f8.exe |
| MSI 975 Platinum PowerUp Edition 7.5 | 9/04/07 | download1.msi.com.tw/files/downloads/bos_exe/7246v76.zip |

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**Intel® Core™ 2 Duo Processor**

| | |
|---|---|
| (12MB Cache, 1333Mhz FSB) | |
| Extreme QX9650 3.00Ghz | $ 2695 |
| (8MB Cache, 1066Mhz FSB) | |
| Quad Q6700 2.66Ghz | $ 2149 |
| Quad Q6600 2.40Ghz | $ 1855 |
| (4MB Cache, 1333Mhz FSB) | |
| E6850 3.00Ghz | $ 1855 |
| E6750 2.66Ghz | $ 1759 |
| E6550 2.40Ghz | $ 1739 |

## Gamer Infinity SLI™ Ultra

NVIDIA® nForce® 780i SLI™ Chipset MB Supporting 3 Way x16 SLI™
**Genuine Windows® Vista™ Home Premium**
Corsair® 4096 MB PC-6400 DDR2-800 Dual Channel Memory
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2x NVIDIA® GeForce® 8800GT 1GB DDR3 in SLI™ Mode 80% Performance Gain over single video card solution. Powered by EVGA
20x DVD+/-RW Drive & 16x DVD-ROM
High Definition 7.1 Surround Sound System
Logitech® 5.1 Subwoofer Speakers, Keyboard & Optical Wheel Mouse
X-Jupiter Full tower Gamer Server Case 600 Watt
COOLERMASTER AQUAGATE S1 LIQUID COOLING SYSTEM
Free 802.11G Wireless PCI Network Adaptor
Add ViewSonic VG2030WM 20" WSXGA Active Matrix Gaming LCD Display for $294

**$1739**

intel
Core™ 2
Extreme
inside™
Hard core.
Quad-core.

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|---|---|
| (12MB Cache, 1333Mhz FSB) | |
| Extreme QX9650 3.00Ghz | $ 1955 |
| (8MB Cache, 1066Mhz FSB) | |
| Quad Q6700 2.66Ghz | $ 1439 |
| Quad Q6600 2.40Ghz | $ 1145 |
| (4MB Cache, 1333Mhz FSB) | |
| E6850 3.00Ghz | $ 1145 |
| E6750 2.66Ghz | $ 1055 |
| E6550 2.40Ghz | $ 1029 |

## Gamer Infinity SLI™ GS

NVIDIA® nForce® 680i LT SLI™ Chipset MB Supporting 2 Way x16 SLI™
**Genuine Windows® Vista™ Home Premium**
Corsair® 2048 MB PC-6400 DDR2-800 Dual Channel Memory
500GB 7200RPM SATA-II 3.0Gb/s 16MB Cache Ultra Fast HD
(2) NVIDIA® GeForce® 8600 GT 512MB. Powered by EVGA
20x DVD+/-RW Drive & 16x DVD-ROM
High Definition 7.1 Surround Sound & 600 Watt Subwoofer Speaker System
Logitech 104 Keyboard and Optical Wheel Mouse
X-Supra Mid-Tower Case 600 Watt w/ see thru window
COOLERMASTER AQUAGATE S1 LIQUID COOLING SYSTEM
Free 802.11G Wireless PCI Network Adaptor
Add ViewSonic Q7B 17" Active Matrix Gaming LCD Display for $195

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|---|---|
| (12MB Cache, 1333Mhz FSB) | |
| Extreme QX9650 3.00Ghz | $ 1909 |
| (8MB Cache, 1066Mhz FSB) | |
| Quad Q6700 2.66Ghz | $ 1399 |
| Quad Q6600 2.40Ghz | $ 1105 |
| (4MB Cache, 1333Mhz FSB) | |
| E6850 3.00Ghz | $ 1105 |
| E6750 2.66Ghz | $ 1015 |
| E6550 2.40Ghz | $ 989 |

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| Extreme QX9650 3.00Ghz | $ 1689 |
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| Quad Q6700 2.66Ghz | $ 1175 |
| Quad Q6600 2.40Ghz | $ 885 |
| (4MB Cache, 1333Mhz FSB) | |
| E6850 3.00Ghz | $ 885 |
| E6750 2.66Ghz | $ 795 |
| E6550 2.40Ghz | $ 769 |

## Gamer Infinity 8000 Dream

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250GB 7200RPM SATA-II 3.0Gb/s 16M Cache Ultra Fast HD
NVIDIA® GeForce® 8500 GT 512MB DDR3. Powered by EVGA
20x DVD+/-RW Drive & 16x DVD-ROM
High Definition 7.1 Surround Sound System
600 Watt Subwoofer Speaker System
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3 Hours Battery Life, Weight only 6.8 Lbs, Free Carrying Case
6 Colors to choose from

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|---|---|
| (800Mhz FSB) | |
| T7700 4MB L2 Cache, 2.40Ghz | $ 1249 |
| T7500 4MB L2 Cache, 2.20Ghz | $ 1169 |
| T7250 4MB L2 Cache, 2.00Ghz | $ 1129 |

**Free shipping**

**$1129**

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- Mobile Intel® PM965 Express Chipset
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2048 MB DDR-II PC5300 667 Memory
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1000/100/10 Network, 56K V.92 Fax/Modem
NVIDIA® GeForce® Go 8600 GT 512MB MMX II w/ HDMI
3-in-1 Built-in Media Card Reader, 3x USB 2.0 Ports,
1 IEEE-1394 Firewire Port, 1 PCMCIA Type II Slot,
3 Hours Battery Life, Weight only 7.6 Lbs, Free Carrying Case
6 Colors to choose from

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| | |
|---|---|
| (800Mhz FSB) | |
| T7700 4MB L2 Cache, 2.40Ghz | $ 1505 |
| T7500 4MB L2 Cache, 2.20Ghz | $ 1429 |
| T7250 4MB L2 Cache, 2.00Ghz | $ 1385 |

**Free shipping**

**$1385**

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# DIGITAL ECONOMY

**Compiled by Steve Smith**

## The Job Search

The world held its breath last month when Google prepared to announce its new plans for a mobile operating system. While something less than the predicted Gphone device emerged, the "Android" platform is a promising open-access operating system for mobile developers. Not surprisingly, the floodgates have opened at Big G's job listing for posts involving mobile. The day after the big announcement, a search of Google's jobs section (run a "mobile" search at google.com/support/jobs) rendered 60 openings.

For instance, the main Mountain View compound needs mobile wireless application developers, which in Google-speak means people with experience programming for "constrained-resource devices" such as PDAs and phones. And because it's Google, you should be platform-agnostic, with experience in BREW, Java, Symbian, Windows Mobile, Palm, and BlackBerry operating systems.

Even if you don't have technical ability, people skills will be critical to the Google strategy, which enlisted more than 30 partners in its new open-access alliance. And so the "Senior Partner Manager—Mobile" spot is more focused on knowing your way around a contract rather than a Treo.

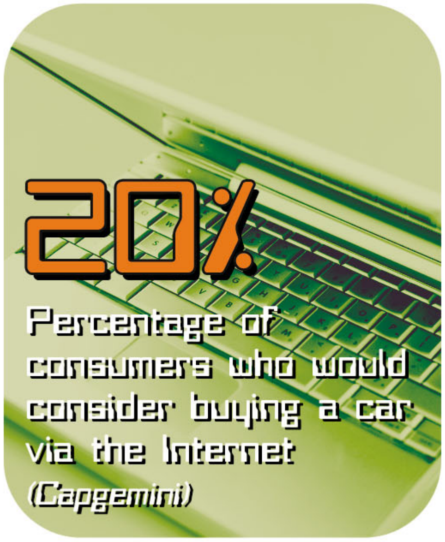
This is not to say that all of the 60 posts here are specifically mobile, but clearly Google expects every aspect of the company to touch the handset at some point. Even the YouTube and videoconferencing technicians are expected to have at least one eye on that Mobile prize.

**google.com/support/jobs**

**1,518**

average number of web pages viewed per person monthly

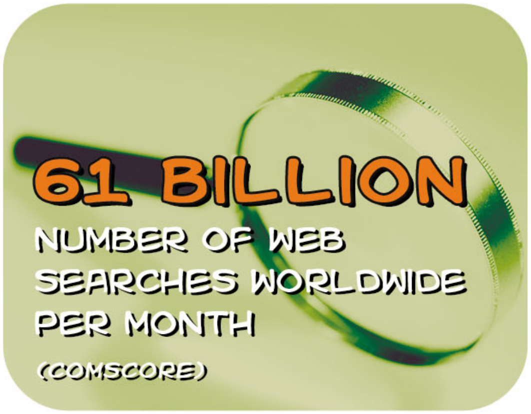
(Nielsen//NetRatings)



**20%**

Percentage of consumers who would consider buying a car via the Internet

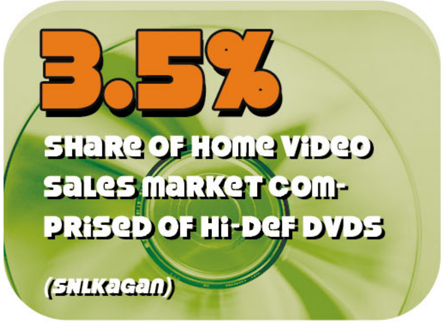
(Capgemini)



**61 BILLION**

NUMBER OF WEB SEARCHES WORLDWIDE PER MONTH

(COMSCORE)



**3.5%**

Share of Home Video Sales Market Comprised of Hi-Def DVDs

(SNLKagan)

## The Drive-By Medium

Internet browsers rarely visit more than one or two pages for every visit to a Web site, according to traffic measurement service OneStat. And yet 4% of visits involve 10 pages viewed or more.

Source: OneStat
www.onestat.com/html/aboutus_pressbox55-pageviews-per-visit.html

### Number of Pageviews per Visit Worldwide

| | | | |
|---|---|---|---|
| 1-2 Pageviews | 62.12% | 7-8 Pageviews | 2.03% |
| 2-3 Pageviews | 12.77% | 8-9 Pageviews | 1.82% |
| 3-4 Pageviews | 6.76% | 9-10 Pageviews | 0.56% |
| 4-5 Pageviews | 7.72% | > 10 Pageviews | 4.02% |
| 6-7 Pageviews | 2.20% | | |

*Source: OneStat*

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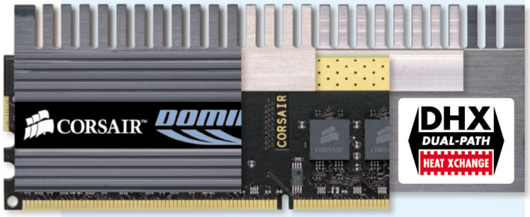

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## The Saint

by Alex St. John

# Whoa

There's something weirdly satisfying about watching giant, complacent, all-powerful institutions struggling to stay relevant as they're displaced by kids slapping together Web sites and online games in their basements.

Think about it: Microsoft just gave Facebook, a company run by a 23-year-old kid, a *$15 billion* valuation. Disney just paid on the order of $700 million for a social networking site for kids called Club Penguin, which those of you who have 8-year-old kids know has almost inconceivably low production values. One can imagine the founders of Club Penguin taking an early prototype of their site to any leading game publisher to ask for funding and getting laughed out of the meeting. The idea that crappy, low-production-value online sites and games slapped together on a shoestring budget could sweep the Internet and generate millions of players and subscribers overnight while the big game publishers are busy spending years of development and millions on cutting-edge games with sky-high production values must be horrifying to them. *How can it happen?*

*Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is president and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM-quality entertainment content over the Web.*

For years, media companies have relied on selling consumers on the value of "fat media" to protect their franchises. Making media that is too fat to be easily copied or shared is essential to preventing the piracy that erodes the value of "premium content." Video is only "valuable" as long as DVDs are hard to copy and share and broadband is too restrictive to easily distribute 8GB movies. As technology advances, media companies have had to convince you that you need "higher-quality" (read: "fatter") media to keep you paying them. What happens to the institution of media when what the content people want most is light, free, inexpensively produced, benefits from copying and sharing, and can be profitable for anybody who can plug in some Google ads and take a credit card payment?

The light MMOG game Runescape was created by a handful of British guys in Cambridge and grew to over 10.8 million players—more players even than World of Warcraft—over a few years with virtually no marketing, advertising, or cardboard boxes in retail. Media companies have spent hundreds of millions of dollars and have devoted enormous teams of people to game development over the course of many years only to achieve lesser results. How is it that a Web search site like Yahoo! has a bigger online gaming audience than EA? Yahoo! threw up a casual game site as an afterthought. After several failed efforts, EA had to acquire a small online game portal called Pogo and pay AOL millions to reach a smaller audience than Yahoo! accumulated accidentally. What happened? Aren't they the experts on games?

The last straw, of course, is the new generation of game consoles. It used to be that a publisher could completely dominate the game business by focusing on producing extremely high-production-value games for two or three platforms with large shares of the market. A few years ago, if you made a PC game, a Game Boy game, and a PlayStation 2 game, you pretty much reached the whole gaming market. Now there are three previous-gen consoles and three current-generation consoles splitting the living room market and 500-plus divergent mobile devices to play games on, leaving the PC as the largest single contiguous platform for game publishing. The whole PC game business is rapidly moving online, eliminating the historical value of the retail channel and replacing it with open online publishing, where free and easily downloadable games are king. There's nowhere safe to run if you're a big-media publisher anymore. The minute the first hit MMOGs reach the next-gen consoles, the world of single-player console games as we know it will be destroyed, just as they were on the PC when WoW hit the market. As WoW has demonstrated, once a consumer gets hooked on an MMOG, they very rarely buy other games.

Five years from now, the U.S. game market will look like Korea; a few mega-hit, micro currency-based MMOGs will dominate the market, and any game not linked to a rich online community will be pirate fodder in the streets. Wal-Mart will be selling game currency at the checkout counter instead of game boxes. ▲

**Send your feedback to thesaint@cpumag.com**

# DREAM HARDWARE

## These Gizmos Don't Sing It, They Bring It

The black box is deathly silent, yet it unleashes your hand-picked collection of cinema spectacle. Liquid metal obelisks, frozen and immutable, lash the room with an aural assault. And the projector may look like a trash can, but isn't. In fact, he'd be offended by the comparison.

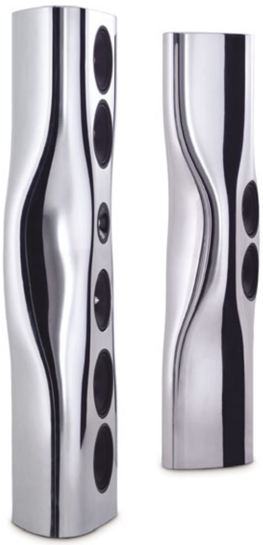
**by Marty Sems**

### FAO Schwartz R2-D2 Digital Video Projector

When first we were introduced to this rotund little chick magnet 30 years ago, he was showing off his hologram to anyone remotely resembling a Jedi. Now you can order your own desk-high astromech-cum-video projector ($2,880; www.fao.com). This R2 unit's an iPod dock, a DVD player, and an FM radio. He's also a self-contained, 20-watt sound system. There's a USB port for external drives or a computer connection, plus a memory card slot. And the remote—shaped like the *Millennium Falcon,* no less—lets you punch up sound effects from the "Star Wars" hexalogy. Now all we need is a drink tray on top and an Ewok-shocking cattle prod attachment, and we can get this weekend started.

### Texas Memory Systems RamSan-500

By now, you've cottoned to the fact that SSDs are the future, although RAM still rules for sheer speed. Hence, longtime Dream Hardware darling TMS (www.superssd.com) has taken a page from mechanical hard drive manufacturers and has paired nonvolatile, NAND-SLC SSDs with a volatile (but battery-backed) DDR cache. The result is ample capacity—up to 2TB—with much of the speed of a pricier, purely RAM-based device (100,000IOps sustained reads). The RAIDed, reliability-enhanced device outpaces a hard drive RAID by a factor of about 16, the company says, yet draws only half the power. A fully-loaded RamSan-500 with a 64GB DDR cache will set you back $329,000. A mere pittance for the fastest flash.



### KEF Muon

The world may have cast its envious eyes on the Esquire North dream apartment in Brooklyn, but our gaze lingered on the arresting pair of speakers from KEF. Designer Ross Lovegrove's Muon ($142,500; www.kef.com/products/muon) are part of an edition limited to just 100 pairs, and they are *flooring*. KEF super-forms sheets of aluminum a quarter-inch thick into highly polished, rigid shells. Two rear bass drivers join the four up front to provide a deep, foundational cradle of sound for the lower-midrange driver and proprietary Uni-Q mid/high array in each 6.5-foot unit. In the negative column is the fact that your date will spend more time looking at your Muon than at you. ▲

# Surround-Sound Headphone Brawl

## Home-Theater Systems That Fit On Your Head

**ZM-RS6F**
$59.95
Zalman
www.zalmanusa.com
●●◖

**ZM-RS6F USB**
$74.50
●●◖

The idea of a true 5.1 surround-sound headset initially sounds like a silly April Fool's Day press release product, along the lines of "instant water powder" (just add water!) or "wireless extension cords." But no, there really are surround-sound headsets, they really do work, and we've checked out 11 of them in a head-to-head comparison—no pun intended.

The concept is simple. Instead of having a single speaker, or "driver," over each of your ears, surround-sound headsets include three or four strategically placed drivers over each ear: one pair for front-left and front-right sounds, one set for the center channel, one set for left- and right-rear (or "surround") sounds, and, usually, one set of compact subwoofer drivers for bass response. Differing volume levels from the different drivers simulate sonic distance (or at least try to).

About half of the headsets connect directly to a sound card with three analog outputs (front, surround, and center/subwoofer); the others have USB connections and their own embedded sound controllers. Each has its own advantages. USB-based headsets can work with basically any PC or Mac with a USB port (even notebooks), including those without sound cards or surround-sound sound cards. There's generally only one cable, so they're easier to hook up and more portable. That said, headsets that work with sound cards, termed "analog headsets," usually sound better, assuming you have at least a quality 5.1 sound card.

### How We Tested

We asked five vendors for both USB and analog headsets. We found that the headphones generally have identical form factors and ergonomics but different connection methods and audio qualities. As such, we'll cover all of a company's products together yet score them individually, starting with the least expensive and working our way higher.

We used a Sound Blaster Audigy LS when we tested our analog headsets and used any supplied software with the USB models. We used DVD software with native 5.1 decoding to soak up the aural excitement of "The Phantom Menace's" pod racing scene and the lobby shooting spree from "The Matrix." We also listened to a variety of MP3s to test music playback. A duo of Sennheiser 2-channel headphones (the HD-280 and PX100) served as our reference sets for music and movies. For game testing, we used Doom 3 and Counter Strike: Source, as we felt those two would put each headphone's surround-sound capabilities to the test.

### Zalman

Known for its high-end PC cooling accessories and computer cases, Zalman's ZM-RS6F and ZM-RS6F USB surprised us by being so reasonably priced. However, it soon became clear that Zalman achieved this by skimping in certain areas, possibly rendering these headsets unsuitable for multiplayer gaming or bass-heavy music.

But first, the good. The Zalmans are double-jointed, allowing for a compact folding while not requiring a strong arc spring; they don't clamp down on the head too strongly. The cushioning is quite soft and comfortable but covered with pleather, so your ears can get rather warm after extended sessions. Their light weight doesn't make your neck sore after a hardcore gaming session.

On the negative, there's no built-in microphone, so you either need an external desk microphone for the analog headset, or totally go without one with the USB set if you lack the proper sound drivers that let you add a mic. Additionally, there are no subwoofer elements (and no wiring or electronics to mimic them), so these are more accurately "5.0 headphones." As such, bass response is predictably very weak. Their design places elements outside the conventional ear barrel, so they're bulky enough to prevent you from lacing your fingers behind your head to lean back and watch a movie.

The Analog ZM-RS6F is the only unamplified analog headset in our sample. So although it isn't burdened with a wall-wart power supply like all the other analog headsets, it sounds noticeably quieter. Unless your sound card has a way to manually adjust the rear or center channel

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**MG-51**
$89.95
LTB
www.ltbaudio.com
●●●◖

**MG-AC97**
$89.95
●●●

volume levels (and most don't), then there is no way to lower the center level yet raise the surround levels, so the resulting surround-sound effect is middling at best. The overall sound quality is relatively poor and lacks clarity, perhaps because of the overwhelming center channel. There are also no on-headset volume controls, so you'll need to program some volume hotkeys into your games or jump out to the Desktop, which is a major hassle.

The USB version fairs a little better. (Considering the Zalman headsets, along with many others in this roundup, have the same internals with a different interface, the improvement is small.) The C-Media (www.cmedia.com.tw) software (shared by all the USB headsets except Turtle Beach's) let us adjust each channel's volume level, and there's a small dongle about 3 feet down the cord with a set of master volume controls. The surround-sound effect was more convincing, but even adjusting the driver's equalizer isn't enough to compensate for the lack of bass. Voices seemed muddy in movies, and in-game sound effects sounded hollow. At least the USB set was amplified, however, so there's sufficient volume.

If you simply must have real surround sound and spend less than $50, the Zalmans aren't a bad choice. But for overall use, a basic 2-channel headset will probably make you happier.

## LTB

LTB is an acronym for "listen to believe," so it comes as no surprise that all LTB makes is headsets, be they 2- or 5.1-channel, wired or wireless. Except for their colors, both the USB-based MG-51 and the analog MG-AC97 look almost identical, being relatively small and lightweight. In fact, their bright colors make them look more like toys than serious headphones.

The LTB design is completely enclosed, and the ear cushions are encased in a relatively thick pleather, which has two effects: Sound doesn't leak out, and your ear might be moist with perspiration after more than 30 minutes of use in a warm environment. Despite this, they're very comfortable over extended periods, yet feel very sturdy.

A set of master volume controls and a very handy mute button are on the left earcup, and a well-placed groove in the casing makes the controls easy for your fingers to find by touch alone. Below these buttons is the built-in microphone, which unfortunately makes you sound like you're trapped in a well covered with a quilt; a boom microphone would eliminate this problem. It's minimally acceptable for multiplayer games, but you'll never be able to use voice recognition software successfully with it. Neither headset has subwoofer elements, but the remaining elements are wired to share the load in delivering bass.

The analog AC97 makes use of a small internal amplifier, powered either with an AC adapter or via a clever USB jack that simply draws 5 volts from an unused USB port. Most analog jacks have predictable color-coding (e.g., green = front), but the AC97's are almost totally backwards. (Trial and error reveals green = front, blue = surround, black = mic, and pink = center/sub). As with the analog Zalman ZM-RS6F, there's no way to adjust the volume of the individual sound channels. The resulting surround-sound effect could be stronger, though it is definitely present. Bass levels are fine, but the center channel lacks "pop" while simultaneously being too loud, and movie dialogue is a tad hollow, though careful equalizer adjustment helps.

Most of the analog headsets have better sound quality than their USB counterparts, but the MG-51 is an exception. The surround-sound effect is remarkably good (movie dialogue sounds more natural, for example), perhaps because the C-Media software can lower the volume of the center channel while raising the rears.

Although the analog AC97 leaves a bit to be desired, the MG-51 turned out to be a surprisingly strong performer, offering fairly good sound clarity and surround-sound effects for its price, along with a compact form factor.

## Tritton Technologies

Tritton Technologies may be the largest PC peripheral company you've never heard of, selling external hard drives, NAS devices, server appliances, and, in this case, audio peripherals. We were given an opportunity to review one prototype unit, the AX51, which should be on sale by the time you read this, and found it to be a compelling blending of the AX360 and the AXPC.

Both the AX51 and AXPC look almost exactly like the Medusa headsets, except for their coloring, the ear padding (a soft, but nonbreathable, pleather instead of fuzzy fabric), and golden swiveling microphone jacks that make the mics detachable. Inside, Tritton has fitted a slightly smaller subwoofer element (30mm vs. 32mm) than the Medusas, but perhaps that's to make space for the built-in rumble pack-like motor, which actually vibrates the headsets under high bass conditions. We first experienced it while playing Doom 3, and, combined with the eerie sound effects and frightening imagery, it scared the living daylights out of us.

The AX360 uses the same bridge hardware and same internal elements, but there's no rumble pack, a different microphone mechanism, and a more compact casing for the earphones themselves. Other

**CPU RANKING** ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

**AX360**
$129.95
Tritton Technologies
www.trittontechnologies.com
●●●●

**AX51**
$69.99
●●●●

**AXPC**
$79.99
●●●●

than the pleather padding covers (which made our ears hot over time), the AX360 was the most comfortable headset tested.

Connection-wise, the analog AX360 was the most versatile headset in the roundup. Its amplifier has both digital fiber optic and digital coaxial jacks, as well as conventional analog inputs for 5.1 sound cards (though you need to supply your own 1/8-inch stereo patch cables). There's a built-in Dolby Pro-Logic mode and time delay function, but they only work with the digital connection. The small rectangular amplifier has inputs on three of its sides, so it looked like a little electrical octopus on the floor next to your PC when we connected all the cords. Practically speaking, it made finding the master volume controls a little hard.

The AX51 and AXPC share what looks like the same excellent, but heavy, control pod about 2 feet down its cord. A cord clip helps relieve the headset of the dongle's weight, but the best place for it is on your lap. The dongle contains four volume knobs for each of the four channels, a master volume switch with a speaker mute control, and a microphone mute switch, but there's no power switch, so it is always on. The AXPC uses the same C-Media software as almost all the other units and has the same features and limitations.

All the Tritton headsets feature excellent 3D effects, clear treble and mid-range, and solid bass (but slightly less bass than the Medusas). Our Audigy-generated effects sounded slightly better than the AXPC's USB chip, but the

| Headphone | MG-51 | MG-AC97 | ZM-RS6F USB | ZM-RS6F | AK-R8 |
|---|---|---|---|---|---|
| Manufacturer | LTB | LTB | Zalman | Zalman | Turtle Beach |
| Interface | USB | Analog | USB | Analog | USB |
| Amp | Internal | Internal | Internal | No | External |
| Detachable mic | Built-in | Built-in | N/A | N/A | Yes |
| Weight | 7 ounces | 7 ounces | 13.6 ounces | 11.2 ounces | 10 ounces |
| Cord length (feet) | 6 | 10 | 8 | 10 | 4+4 |
| Compatibility | WinXP/Vista/ Mac OS X | WinXP/Vista/ Mac OS X* | WinXP/Vista/ Mac OS X | WinXP/Vista/ Mac OS X* | WinXP/Vista/ Mac OS X |
| No. of speakers | 6 | 6 | 6 | 6 | 8 |
| Center size (millimeters) | 15 | 15 | 40 | 40 | 30 |
| Surround size (millimeters) | 15 | 15 | 40 | 40 | 40 |
| Front size (millimeters) | 40 | 40 | 40 | 40 | 40 |
| Subwoofer size | N/A | N/A | N/A | N/A | 30 |
| Balance controls | Software | No | Software | No | Software |
| Master volume | Yes | Yes | Yes | No | Yes |
| Mic mute | No | No | N/A | N/A | No |
| Foldable | Flat | Flat | Semi-crouching | Semi-crouching | No |
| Noise-cancelling mic | Yes | Yes | N/A | N/A | Yes |
| USB converter | Yes | N/A | No | N/A | No |
| Warranty | 1 year | 1 year | 1 year | 1 year | 90 days |
| EAX | Yes | N/A | Yes | N/A | Yes |
| Sound quality | 3 | 2.5 | 2 | 2 | 4.5 |
| Surround quality | 3.5 | 3 | 2.5 | 2.5 | 4 |
| Overall rating | ●●●◖ | ●●● | ●●◖ | ●●◖ | ●●●●◖ |
| Price | $89.95 | $89.95 | $74.50 | $59.95 | $149.95 |

**Mac OS X compatibility requires system with three analog audio jacks.*

**CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT**

AXPC's USB chip was still quite good. The rumble pack is totally silent but integrated with the subwoofer so it can't be shut down (unless you reduce the bass in the EQ), although we wouldn't want to. The microphone records with high quality.

The AXPC and AX51 are exceptionally well-priced for the quality sound and 3D effects they deliver, and their rumble packs are unique and engaging. If you're on a sub-$100 budget, look no further.

**Medusa 5.1 Home Edition**
$146.12
Speed-Link
www.medusa-usa.com
●●●●◖

**Medusa 5.1 Mobile**
$118.77
●●●●

## Speed-Link

Medusa-USA is the only authorized reseller of Germany's Speed-Link (www.speed-link.com) surround-sound hardware, and in addition to rebranding it, Medusa-USA backs it with a two-year warranty. The U.S. reseller also repackages it into something suitable for giving as a gift, as the hardware lies in a black, satin-lined box bound with a red ribbon. Very classy.

Both headsets are identical, offering earpads wrapped in a breathable, fuzzy cloth. The outer casing has vents for a little air circulation, although a little bit of sound leaks out as a result. The headsets aren't light, but thick padding on the bridge and only light clamping keep them comfortable for hours. The permanently attached sound-cancelling boom mic sounds great yet swivels out of the way without straining the swivel mechanism.

The analog version utilizes a large, vertically-oriented amplifier that doubles as a stand for the headphones when not in use. It accepts two sets of analog inputs at the same time (eight input jacks total) and a button switches between them, while a set of output connections (and a bypass button) let you connect your desktop speakers and easily switch from headset to speakers without swapping cables. It also houses the master volume knob. Included wiring adapters permit plugging the headset directly into the sound card or regular 2-channel headphone jack, and extra-long patch cables are also included for connecting the amp. 2 feet down the headset's cord

| HPA2 | AXPC | AX360 | AX51 | Medusa 5.1 Mobile | Medusa 5.1 Home Edition |
|---|---|---|---|---|---|
| Turtle Beach | Tritton Technologies | Tritton Technologies | Tritton Technologies | Medusa | Medusa |
| Analog | USB | Analog | Analog | USB | Analog |
| External | External | External | External | External | External |
| Yes | Yes | Yes | Yes | No | No |
| 10 ounces | 12.2 ounces | 12 ounces | 12.2 ounces | 11.5 ounces | 11.5 ounces |
| 6+4 | 5+2 | 13 + amp wiring | 11+2 | 5+2 | 13+6 |
| WinXP/Vista/ Mac OS X* | WinXP/Vista/ Mac OS X | WinXP/Vista/ Mac OS X* | WinXP/Vista/ Mac OS X* | WinXP/Vista/ Mac OS X | WinXP/Vista/ Mac OS X* |
| 8 | 8 | 8 | 8 | 8 | 8 |
| 30 | 30 | 30 | 30 | 30 | 30 |
| 40 | 30 | 30 | 30 | 30 | 30 |
| 40 | 40 | 40 | 40 | 40 | 40 |
| 30 | 30 | 30 | 30 | 32 | 32 |
| Yes | Yes + software | Yes | Yes | Software | Yes |
| Yes | Yes | No | Yes | Yes | No |
| No | Yes | No | Yes | No | No |
| No | Flat | Flat | Flat | Flat | Flat |
| Yes | Yes | Yes | Yes | Yes | Yes |
| No | No | N/A | N/A | No | No |
| 90 days | 1 year | 1 year | 1 year | 2 years | 2 years |
| N/A | Yes | N/A | N/A | Yes | N/A |
| 4.5 | 3 | 3.5 | 3.5 | 3.5 | 4 |
| 4 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| ●●●●◖ | ●●●● | ●●●● | ●●●● | ●●●● | ●●●●◖ |
| $129.95 | $79.99 | $129.95 | $69.99 | $118.77 | $146.12 |

*Mac OS X compatibility requires system with three analog audio jacks.*

**CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT**

**AK-R8**
$149.95
Turtle Beach
www.turtlebeach.com
●●●●◖

**HPA2**
$129.95
●●●●◖

is a lightweight, four-knob dongle for multichannel volume adjustment. The amp is powerful enough to raise the volume to painful levels.

The USB version replaces the potential rat's nest of wiring with a single USB cable and a snazzy carrying case, suitable to impress at your next LAN party. Two feet down the relatively short cable is a lightweight dongle with a master volume control and a microphone mute button. It utilizes essentially the same C-Media software as the other USB headsets to adjust volume levels independently. Although it also provides an equalizer, the headphones sound good enough that the EQ isn't needed for compensation, just like the Trittons. Also, as with all the other USB headsets, you can't plug it into a different USB port after installing the software without reinstalling the software (so remember which one you used the first time). You also can't listen to audio from both your desktop speakers and the headset at the same time, because Windows can only use one audio device at the same time.

Overall audio quality is quite good, with good separation, natural-sounding voices, and deep bass. The USB version sounds slightly less rich than the Medusa 5.1 Home Edition (when it's connected to the Audigy's and using the amp); without including the Home Edition's amp, we thought the USB set sounded better and louder.

Medusa's analog arrangement is the ideal combination of flexibility, comfort, and sound quality, while the USB headset gives up only a little sound quality for USB convenience and portability.

## Turtle Beach

Known for its extensive line of audio products, Turtle Beach's surround-sound headphones are an excellent example of why the company specializes in making quality audio peripherals.

Both the analog HPA2 and the USB AK-R8 use identical headset units, and their use of common mini-DIN 9 jacks actually allows for interchangeability. In fact, you could use the company's $80 Audio Advantage SRM to convert the HPA2 to an AK-R8 for ultimate flexibility. Earcups are lined with soft, fuzzy fabric that lets the ears breathe somewhat, but the spring tension that clamped them onto one's head was a little too tight for us. It becomes fatiguing after an hour or so, but the tension might loosen over time. A wide sub-strap mades the headsets feel nearly weightless and well-balanced, though they feel bulky. The noise-cancelling stereo microphone is the best of the lot by a small margin, providing hiss- and echo-free, clear voice communications. A sponge wind blocker prevents "breath pops." It is easily removable and locks into place via a clever cam, but its axis of rotation makes swinging it up and out of the way awkward.

A small analog amplifier is attached to the HPA2 about 4 feet down its cord, letting it rest on the ground when seated in a typical chair, taking some weight off the headphones. It contains a master volume control (which doubles as the power switch) and four individual volume knobs, but the power adapter plugs into the cables next to the analog jacks, so extending the reach of the entire cord set may be tricky. Each HPA2 comes with a set of three audio jack splitters (one for each channel), which lets you simultaneously plug both your normal speakers and the HPA2 into your sound card, though you need to remember to turn off what you aren't listening to manually. A "normal" stereo plug adapter is also included, so you can use the HPA2 directly with an iPod or other stereo source.

The similarly-sized USB amplifier only has a master volume and mute control, but it also has a built-in microphone that works if the boom mic is disconnected. The AK-R8 uses a newer and higher-end C-Media chipset than its competition, and its software is significantly more attractive, easier to use, and fuller-featured. It's also fully compatible with games utilizing the OpenAL engine, which other USB headsets aren't. It is also smart enough to remind you to use the same USB port or reinstall the software if you choose a different one.

The headsets use the largest set of drivers of any of our test units, and it shows in their sound quality and clarity. The USB version sounds every bit as good as its analog counterpart, with sparkling highs, dazzling dialogue, and deep bass that surpasses the competition. The Medusas and the Trittons convey the 3D space just slightly better, but you can only tell comparing them side by side.

If overall sound quality is paramount to you, the Turtle Beach headsets should be your top choice.

## A Word On CPU Utilization

USB headphones may be convenient, cord-wise, but they do add to your CPU's workload. To test this, we used RightMark 3D Sound (cpu.rightmark.org). All of the USB headsets (except the AK-R8, which uses a different chip) hovered around 10% CPU utilization for 3D sound; that jumped to 13% for EAX sound. The more efficient AK-R8 ranged between 6 to 10%. Analog sets faired better, as the Audigy LS used only 5% and 10% on 3D and EAX effects, respectively. ▲

**by Warren Ernst**

**CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT**

# S12 II

SILENT 12CM FAN SERIES

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80 PLUS

Seasonic is the first manufacturer who qualifies 80PLUS Energy Efficiency Certification around the world. All Seasonic models meet the 80PLUS challenge under different percentage of loading circumstance, reduce energy waste efficiently, and improve daily electric bill saving.

| AC Input / DC Output | 300W | 400W | 500W |
|---|---|---|---|
| 80Plus certified PSU | 246W<br>(300 X 82%) | 328W<br>(400 X 82%) | 410W<br>(500 X 82%) |
| Non-80Plus certified PSU | 204W<br>(300 X 68%) | 272W<br>(400 X 68%) | 340W<br>(500 X 68%) |

Note : The higher efficiency, the more energy could be used from AC to DC wisely.

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# Beyond Dual Displays

## Desktop As Far As The Eye Can See

It's no secret that power users are expert multitaskers. But you can only cram so many windows on a single display. Thanks to cheap LCDs and even cheaper graphics cards that support dual displays, most of us have ample opportunity to expand our horizons. If you think two displays are better than one, then a quad-display setup is sure to put an extra-wide smile on your face.

We got our hands on a several multimonitor graphics adapters and threw them at a mishmash of monitors of different sizes and resolutions to see if our personal video wall could really improve our productivity. Our test system was built around an Asus P5B Deluxe, 2.93GHz Intel Core 2 Extreme X6800, 150GB 10,000rpm Western Digital Raptor loaded with Windows Vista 32-bit, and 2GB of Corsair Dominator DDR2-1066 system memory. The displays we used are an IBM L200P (1,600 x 1,200), a Lenovo L171 (1,280 x 1,024), a Samsung SyncMaster 245BW (1,920 x 1,200), and an Acer AL2016W (1,680 x 1,050).

### Quadro FX 4500 X2

Nvidia's 2D and 3D workstation workhorse, the Quadro FX 4500 X2, features Nvidia's dual-PCB design that incorporates two Quadro FX 4500 GPUs into a single PCI-E dual-slot card, much like the GeForce 7950 GX2. The Quadro FX 4500 X2 is ideally suited to graphics professionals who use applications specific to oil and gas exploration, medical imaging, visualization and simulation, and broadcast and film.

Quadro FX 4500 X2's PCB is a stunning 12+ inches long. Not many workstations have windowed side panels, but this card's green LED-lit fans add a little flair to an otherwise utilitarian component. The card features four dual-link DVI connectors, each of which support a single display at resolutions up to 2,560 x 1,600. Other highlights include support for 32X FSAA, 512MB of GDDR3 per GPU, and, with the flick of a software switch, SLI. The Quadro's SLI is the same as Nvidia's GeForce cards in that it's not supported on multiple monitors.

When configuring the Quadro FX 4500 X2, we had to use the Windows Display Properties to enable all four displays before the Nvidia Control Panel would recognize them. Each GPU handled two monitors, so once we enabled them all, we used the Nvidia Control Panel to set them to Clone mode (same display on both monitors) or Dualview mode (both monitors configured independently).

### Quadro NVS 440

The NVS 440 is a full-height card with a passive heatsink available in PCI-E x16 or x1 varieties. The unit comes with 256MB of onboard DDR, but it borrows an additional 256MB of system memory to give each monitor a 128MB frame buffer. Like the Quadro FX 4500 X2, Nvidia's nView multidisplay technology lets users configure the displays in Clone or Dualview modes. According to Nvidia, this card is best suited for 2D business applications.

The NVS 440 employs two DMS-59 connectors and a pair of Y-cables with dual DVI plugs to connect up to four displays. We again had to use the Windows Display Properties dialog box to enable all of the displays and the Nvidia Control Panel to do the fine-tuning. The NVS 440 can handle maximum digital display resolutions of up to 1,920 x 1,200 and analog resolutions up to 2,048 x 1,536.

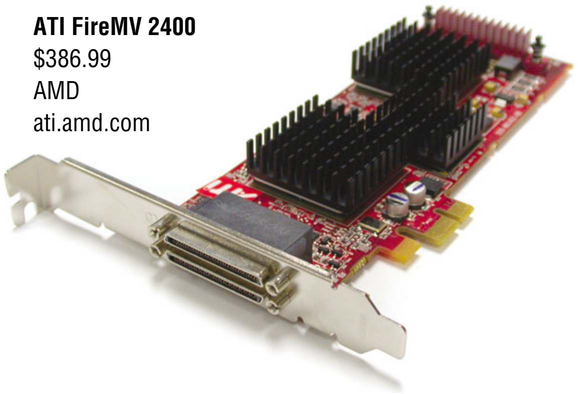
### ATI FireMV 2400

ATI's quad-output workstation card is the FireMV2400, a single-slot, low-profile, passively-cooled card that, according to AMD, is best suited for 2D business applications. We tested the PCI-E x1 card,

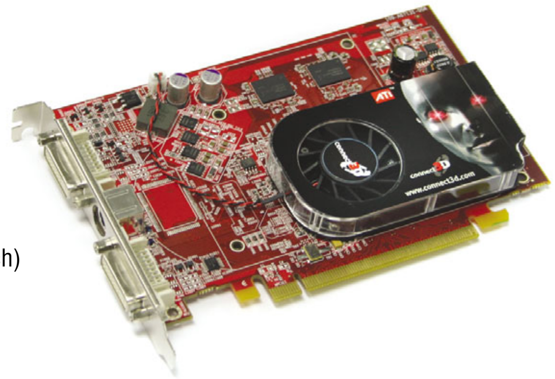
**Quadro FX 4500 X2**
$3,699
Nvidia
www.nvidia.com

**Quadro NVS 440**
$495
Nvidia
www.nvidia.com

**ATI FireMV 2400**
$386.99
AMD
ati.amd.com



**ATI Radeon X1300 XT**
$107.99 (each)
AMD
ati.amd.com



but AMD also offers a PCI version for legacy systems. The unit features dual GPUs, each of which has 128MB of dedicated DDR (for a total of 256MB). Using the Catalyst Control Center, we were able to extend the Desktop across all displays or clone the display.

The card features two VHDCI (Very High Density Cable Interconnect) ports for attaching the two dual-DVI Y-cables. We were able to get our system to detect and enable all four monitors from the Catalyst Control Center. The utility also lets you independently adjust the rotation of each display. The FireMV 2400 supports digital display resolutions up to 1,600 x 1,200 and analog resolutions up to 2,048 x 1,536.

## ATI Radeon X1300 XT

As we've seen, workstation GPUs deliver on their multiple monitor promise, but for the average power user, these options can be cost-prohibitive. For quad displays on a tight budget, we plugged two Radeon X1300 XTs into our system. AMD's ATI Radeon X1300 XT features a 500MHz core clock and an 800MHz memory clock. The cards we tested each came with 256MB of GDDR3 memory, dual DVI ports, and a TV-out port.

The Radeon X1300 XT is a full-height card that features a fan-cooled heatsink and shroud that occupies roughly a third of the PCB. When we fired up the system, the difference between the workstation cards and our budget cards immediately became painfully obvious: The dual Radeon X1300 XTs were noisy.

On the software side, we were pleased to find that configuring the four displays with two Radeons in a CrossFire setup was as simple as configuring the Fire MV2400. The Catalyst Control Center immediately recognized all of the displays, letting us configure them from a single interface. ▲

**by Andrew Leibman**

## Get An Eyeful

Although 3DMark06 and PCMark05's graphics routines aren't particularly suited to testing workstation graphics cards, these scores do reveal the difference in performance you might expect when running 2D and 3D applications with each quad-monitor setup. The Radeon X1300 XT failed to post scores in most of PCMark05. We tried the benchmark with all four monitors set to the native aspect ratios and again at 1,024 x 768, but still couldn't get the system to post scores.

| | Quadro FX 4500 X2 | Quadro NVS 440 | FireMV 2400 | Dual Radeon X1300 XTs |
|---|---|---|---|---|
| **3Dmark06** | | | | |
| Overall | 4916 | 473 | 82 | 2610 |
| SM2.0 | 1922 | 144 | 37 | 947 |
| HDR/SM3.0 | 1864 | 181 | N/A | 947 |
| CPU | 2510 | 2498 | 2513 | 2499 |
| **PCMark05** | | | | |
| Overall | 7796 | 5950 | 4947 | Failed |
| 2D Transparent Windows* | 3804.822 | 2881.886 | 3416.261 | Failed |
| 2D Graphics Memory- 64 Lines | 2100.309fps | 520.068fps | 520.068fps | 901.233fps |
| 2D Graphics Memory- 128 Lines | 1653.591fps | 382.59fps | 118.613fps | 737.629fps |
| 2D WMV Video Playback | 34.928fps | 35.585fps | 34.870fps | Failed |
| 3D Fill Rate** | 10331.967 | 927.927 | 471.976 | Failed |
| 3D Polygon Throughput*** | 11.531 | 2.218 | 0.852 | Failed |
| 3D Pixel Shader | 312.175fps | 26.973fps | 10.494fps | Failed |
| 3D Vertex Shader**** | 45.315 | 11.279 | 4.092 | Failed |

*Windows per second **MTexels ***MTriangles per second ****MVertices per second

### SPECS

Quadro FX 4500 X2: Interface: PCI-E x16; quad-monitor support; dual-slot design; 1GB GDDR3 (512MB per GPU); Max resolution: 2,560 x 1,600

Quadro NVS 440: Interface: PCI-E x16 or PCI-E x1; quad-monitor support; single-slot passive cooling; 256MB memory (128MB per GPU); Max resolution: 1,920 x 1,200 (digital), 2,048 x 1,536 (analog)

ATI FireMV 2400: Interface: PCI or PCI-E x1; quad-monitor support; half-height card; single-slot passive cooling; 256MB DDR memory (128MB per GPU); Max resolution: 1,600 x 1,200 (digital), 2,048 x 1,536 (analog)

ATI Radeon X1300 XT: Interface: PCI-E x16; dual-monitor support (per card); single-slot active cooling; 256MB GDDR3 memory; Max resolution: 2,560 x 1,600

# Palm Centro

With Windows Mobile on the rise, the iPhone continuing to grab headlines, and Google's mobile OS Android making waves, it's easy to forget that Palm's smartphone OS is among the most mature and flexible approaches for phones. And Centro is here as a gentle reminder. At 4.2 x 2.1 x 0.73 inches (HxWxD) and 4.2 ounces, the spectacularly small unit makes smartphones compact and affordable ($99 with Sprint plan) for everyone. With a microSD card slot and 64MB RAM, it gives you room to work.

The best news is that Palm essentially has shrunken the Treo without compromising too many features. The full and very good Palm OS is here, with email, text messaging, and a strong mobile Web browser called Blazer. Plus, the Centro boasts a large library of apps, such as DataViz's Documents to Go program for creating Office-compatible documents. We loved the addition of Sprint's IM client, which lets you flick across open tabs for AIM, Yahoo!, and MSN accounts. Google Maps weren't quite as animated as the iPhone's, but they got the job done of mapping and providing turn-by-turn directions.

And because the Centro runs on the EVDO broadband network, you also get Sprint TV streaming video service. Although it's a nice feature, the disappointing low resolution of the video feeds just didn't take full advantage of the bright and sharp 1.56-inch display.

Input flexibility is what makes the Centro shine above anything else in this form factor. The QWERTY keyboard is the smallest you will ever find, but we found it surprisingly usable. The touchscreen, although a bit challenging at this size, let us dial and navigate menus easily.

The Centro's 312MHz Intel XScale CPU can be a little sluggish in the multimedia player, and we wouldn't want to rely on that tiny keypad for dialing. But quibbles aside, Palm's superb, approachable Centro gives you all the power of the big smartphone bricks at a fraction of the bulk. ▲

**by Steve Smith**

**Specs:** Palm OS 5.4.9; 312MHz Intel XScale processor; 64MB memory; Touchscreen: 1.56 inches, 320 x 320; 1,150mAH Li-Ion battery (3.5 hours talk time, 300 hours standby)

**Centro**
$399 (without wireless plan)
Palm
www.palm.com
●●●●

# XFX GeForce 8600 GT Fatal1ty

With the advent of the HTPC, the need for quiet, power-efficient components has given birth to a whole new market niche of products. The passively cooled and completely silent GeForce 8600 GT Fatal1ty from XFX is one of those products that caters to this niche and also offers cutting-edge DX10 graphics capabilities.

The 8600 GT Fatal1ty is endorsed by pro gamer Jonathan "Fatal1ty" Wendel and deviates from the standard reference design, not only with its exotic single-slot heatpipe-style GPU heatsink but also with its above-and-beyond factory overclock of 620MHz GPU and 1.7GHz DDR3 memory speeds. (540MHz Core and 1.4GHz memory are Nvidia reference card speeds.) The card also comes with 256MB of frame buffer memory, which is about the only thing "standard" on the product.

Taking the 8600 GT Fatal1ty for a spin around the benchmark circuit, we were more than satisfied with its performance, which overtook our stock GeForce 8600 GT by 10 to 20% in virtually any gaming workload we threw at it. The 8600 GT Fatal1ty weighs in at $159.99 retail, a solid $30 to $40 higher than most standard GeForce 8600 GT cards. In short, you'll pay a bit more for the card's stealthy acoustics, but if you want solid, silent graphics power, this card is right up your alley. ▲

| | XFX GeForce 8600GT Fatal1ty | Stock GeForce 8600 |
|---|---|---|
| **Company of Heroes**<br>1,280 x 1,024 (4XAA) | 30.8 | 27.3 |
| **F.E.A.R.**<br>1,280 x 960 (No AA) | 76 | 67 |
| **Half-Life 2: Episode 1**<br>1,280 x 1,024 (4XAA, HDR) | 57.45 | 50.14 |
| **Quake 4**<br>1,280 x 1,024 (4XAA) | 52.2 | 44.3 |

**by Dave Altavilla**

**Specs:** GPU clock: 620MHz; Memory: 256MB DDR3 (1.7GHz effective); Ports: 2 dual-link DVI, TV-out; single-slot form factor

**GeForce 8600GT Fatal1ty**
$159.99
XFX
www.xfxforce.com
●●●◖

**CPU RANKING** ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

**X-Jupiter**
Best cooling tool-free extended aluminum full tower with fan controllers and temperature LCD.

X-Jupiter

**X-Telstar**
Fully loaded aluminum full tower case w/ refined LCD shows output voltages, sound volume, fan speed, and more...

X-Telstar

**X-Qpack2**
Perfect choice and best cooling for compact portable aluminum case w/ 500W PSU and a strong durable handle for grab-and-go.

X-Qpack2
(Special Edition)

**Iceberg Power 680W**
Most magnificent see-through 680W power supply with color sleeves and adjustable LED lights - blue, green and red.

Iceberg Power 680W

**X-Cruiser**
Thermally advantaged chassis w/ 3 gauge for fan speed, temperature and volume sensitivity controller more...

X-Cruiser

COMPUSA DIRECTRON.COM EPROM COMPUTER SYSTEMS Fry's ELECTRONICS MAX GROUP mwave.com newegg.com TigerDirect.com oxide.com

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# StarTech.com WiFi Detector

When going wireless, it's very helpful if you can locate wireless networks and assess the strength of the wireless signals before you unpack your notebook, start it up, and search for a wireless signal. StarTech.com's WiFi Detector (previously known as the Wi-Fi Detective) can help you track down wireless networks.

What sets the WiFi Detector apart from many similar products is its built-in LCD that shows you all of the vital information about detected networks. The screen shows the number of detected unencrypted and encrypted wireless networks. For each wireless network, the WiFi Detector displays information such as the operating channel, wireless encryption used (if any), 802.11b/g status, signal strength, battery status, SSID (provided it is broadcast), and more.

Although a convenient handheld Wi-Fi locator, this product can also connect to your notebook to operate as a USB wireless network adapter and as a wireless access point, which was very easy to set up. In addition, it provided full signal strength when I used another notebook to connect to the network. It has many security features. For example, in addition to support for WEP, WPA, and WPA2 encryption, the WiFi Detector also provides options for limiting the maximum packet size of transmitted data or applying MAC filtering (using either a whitelist or a blacklist).

The WiFi Detector recharges when it's plugged in to your computer's powered USB port, and the LCD shows the current battery charge status. Furthermore, you can maximize battery life by selecting from three power-consumption settings.

For travel outside the United States, the WiFi Detector's World Mode is handy. In World Mode, the WiFi Detector, acting as a wireless network adapter, automatically follows the settings of the WAP to which it connects to ensure that it functions at a transmission power and frequency that complies with that country's regulations.

The WiFi Detector won't win any points for style with its bland beige design. However, if your primary concern is detecting wireless networks and viewing plenty of details about each network's settings and signal strength, you'll find plenty to like about the WiFi Detector. ▲

**by Kylee Dickey**

**Specs:** 802.11b/g; Dimensions: 1.12 x 3.58 x 0.55 inches (HxWxD); LCM: 96 x 32 pixels with EL backlight; 4.2V rechargeable Li-Polymer battery

**WiFi Detector**
$74.99
StarTech.com
www.startech.com
●●●●

# Sling Media Slingbox SOLO

The Slingbox SOLO is the latest in a line of excellent Slingboxes from Sling Media. The little black box lets you watch and control your TV with your PC or smartphone anywhere in the world over the Internet. As the little brother of the Slingbox family, the SOLO supports just one input at a time.

Setup was a cinch. I just connected the composite A/V, Ethernet, and IR cables to my DVR, the Slingbox, and my router. After downloading the software and following the setup wizard, I was watching TV on my PC. Although my router, a Linksys WRT54G 802.11g, required no configuration to work with the Slingbox, it's worth noting that some users will find that some additional router configuration is required. Thankfully, Sling Media's Web site has tutorials for setting up dozens of different routers. Whether you need to open a port or disable a firewall, you'll be able to troubleshoot the problem.

On my wireless home network, I had a clear, smooth picture at 5,000 to 5,600Kbps with an excellent 802.11g connection. When remotely using the Slingbox, a strong 802.11b connection got me bit rates at 400 to 450Kbps. Although the picture was blocky on the slower connection, the action was butter-smooth with no lag whatsoever. The Slingbox automatically optimizes the video stream, but you can manually adjust parameters such as video bitrate, frames per second, and video resolution.

One annoyance is that no matter the strength of the connection, when you change the channel, there is a one- or two-second lag. With a weaker or remote connection, the lag is followed by up to 30 seconds of buffering. Even with the buffering, though, the picture hiccups very little.

The only other complaint I had was that because the Slingbox has no Wi-Fi capability (just a 10/100 Ethernet port) and my router was across the room from my TV, I had to either run the cables across the floor or consider a workaround. Sling Media suggests buying SlingLink to send the signal through wall outlets, which is essentially Sling Media's proprietary version of a power line network adapter. Any such adapter with adequate throughput will work, including gaming adapters, but in any case, you'll have to use another device to use the Slingbox wirelessly. ▲

**by Seth Colaner**

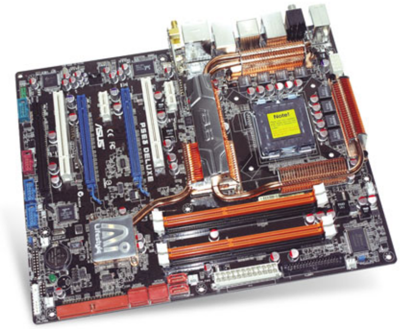
**Specs:** SD or HD (1080i or 720p) compatible; Video inputs: component, S-Video, composite

**Slingbox SOLO**
$179.99
Sling Media
www.slingmedia.com
●●●●

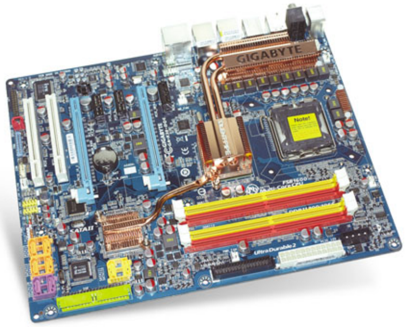
**CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT**

# Asus P5E3 Deluxe & Gigabyte GA-X38-DQ6

## A Pair Of X38 Boards Duke It Out



**P5E3 Deluxe**
$299
Asus
www.asus.com
●●●●



**GA-X38-DQ6**
$279
Gigabyte
www.nvidia.com
●●●◖

Motherboards based on Intel's flagship X38 Express chipset have begun trickling out, and the first two to arrive in the lab in full retail trim come by way of Asus and Gigabyte. Asus' offering requires DDR3 memory, while Gigabyte's works with more affordable DDR2. Both boards exploit all of the features inherent in the X38 chipset though, such as support for PCI-E 2.0, Intel Extreme Memory technology, and future 45nm processors.

### Asus P5E3 Deluxe

As we've come to expect from Asus, the P5E3 Deluxe includes an elaborate assortment of bundled accessories. We also found a pair of cooling fans and a pair of Wi-Fi antennas to complement the board's integrated 802.11n controller.

The P5E3 Deluxe is chock full of extra goodies and outfitted with an oversized cooling setup of multiple copper heatsinks, linked together with a complex heatpipe system. Generally speaking, the P5E3 Deluxe's layout is quite good. The area around the CPU socket is surrounded by copper heatsinks (which may pose a problem for some oversized aftermarket CPU coolers).

The P5E3 Deluxe's two blue PEG slots each have 16 lanes of PCI-Express connectivity, while the black slot only has four lanes at its disposal. Thanks to the P5E3 Deluxe's use of Intel's ICH9R southbridge, the board supports multiple RAID modes and has six internal SATA ports.

We should also note that the P5E3's BIOS is as complete as any you'll find, and overclocking was a breeze. We had no trouble topping out at an impressive 515MHz FSB frequency. With its great bundle, excellent overclocking, and strong performance, the P5E3 Deluxe should be on your short list of X38 mobos.

### Gigabyte GA-X38-DQ6

True to Gigabyte's tradition, the X38-DQ6 ships with a slew of stuff thrown in. Two particularly useful items are a pair of slot-mounted brackets that house eSATA ports. These brackets bring eSATA and power connectors to any open slot location, and data and power cables to be used with the brackets are included.

Like Asus' offering, X38-DQ6 has a wide array of RAID, FireWire, and network controllers. Plus, its layout is fairly clean. All of the board's connectors are situated around the edge of the PCB, which helps with internal cable management. And like some of Gigabyte's other high-end offerings, the X38-DQ6 has an intricate cooling apparatus. The chipset and voltage regulators are all adorned with high-quality copper heatsinks, linked together with heatpipes.

The X38-DQ6's BIOS is also solid, and overclocking to a 500MHz FSB was quick and painless. This DDR2 board is worthy of your consideration for a DD2-compatible X38 motherboard. ▲

| | Asus P5E3 Deluxe DDR3-1333MHz | Gigabyte X38-DQ6 DDR2-1066MHz |
|---|---|---|
| **SiSoft SANDRA XI SP2** | | |
| Processor Arithmetic | 24,619 | 24,612 |
| Drystone ALU (MIPS) | 17,154 | 17,146 |
| **Memory Bandwidth (Buffered)** | | |
| RAM Bandwidth Int. iSSE2 (MBps) | 7,101 | 6,316 |
| RAM Bandwidth Float iSSE2 (MBps) | 7,119 | 6,321 |
| **Futuremark PCMark05** | | |
| CPU | 6861 | 6841 |
| Memory | 6327 | 6062 |
| **LAME MT** | | |
| Multithreaded (min:sec) | 0:34 | 0:34 |
| Sony Vegas (seconds) | 404 | 393 |
| F.E.A.R. v1.08 (640x480, Low-Quality) | 267 | 244 |

**Specs**

P5E3 Deluxe: Socket LGA775; Intel X38 Express; Max memory: 8GB (DDR3-1333MHz); Slots: 3 PCI-E x16, 2 PCI-E x1, 1 PCI

GA-X38-DQ6: Socket LGA775; Intel X38 Express; Max memory: 8GB (DDR2-1066MHz); Slots: 2 PCI-E x16, 3 PCI-E x1, 2 PCI

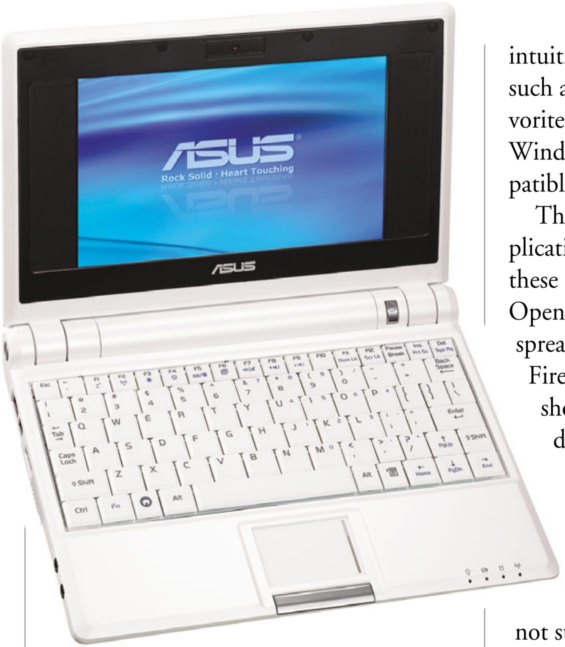
P5E3 Deluxe used Corsair TWIN3X2048-1800C7DF memory; GA-X38-DQ6 used Corsair TWIN2X2048-8500C5

**by Marco Chiappetta**

**CPU RANKING** ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

# Asus Eee PC 701 4G

The UMPC world certainly has been buzzing as of late, but nothing has caused nearly as much fanfare as the Asus Eee PC. Positioned by some industry analysts as a response to the OLPC (One Laptop Per Child) organization's low-cost XO-1 notebook, the Asus Eee PC is both highly mobile and highly affordable, with basic configurations priced at $299 to $399 on the high end of its lineup. However, the Asus Eee PC is a breed apart in reality, offering a significantly more professional design compared to the XO-1's toy-like appearance that is squarely targeted as a starter PC for children.



## External Design

For starters, the Eee PC is built of a fairly rugged plastic composite material. We took a look at a pearl-white 701 4G. Comparatively, the machine's design and construction is similar to a light, ultra-thin notebook, but with a much smaller 7-inch LCD. The screen itself had excellent contrast and color saturation but could've used a bit more overall brightness (which wasn't surprising, given the machine's available power budget). Regardless, the Eee PC was very easy on the eyes. The unit's QWERTY keyboard was a bit cramped, but with roughly a 1- x 9- x 6.5-inch profile (HxWxD), that stands to reason. Regardless, we only needed an hour or two to get used to the keyboard.

## Under The Hood

The 701 4G uses a 900MHz Intel Mobile Celeron ULV processor saddled to an Intel 910M mobile chipset, and Intel's GMA900 provides the graphics. The system's Atheros 802.11g chipset held a strong signal—better than any Wi-Fi NIC we've seen in a long time. The system also comes equipped with a 10/100 Ethernet port.

Our unit included a 4GB Silicon Motion SSD, but configurations of up to 8GB are available. We also had an optional 0.3MP Web cam built into the screen's bezel. The mighty mite also features a VGA output and two USB ports on the machine for adding external storage or an optical drive. What's most amazing is the 701 4G's power consumption. We measured the Eee PC at idle and under full load, and it sipped the juice at a low 14.5W to a peak consumption of 18W. Battery life was a respectable 3.5 hours. The 701 4G's miserly power consumption didn't hinder its startup time—a lightning-fast 15 seconds.

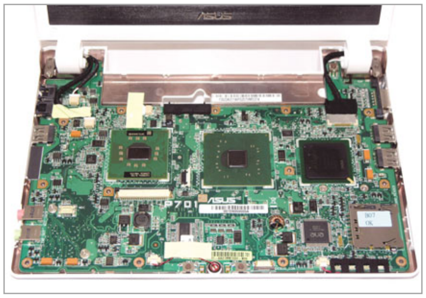
## An Open-Source OS & Third-Party Software

Software-wise, Asus went open-source and built its first units on Xandros Linux with a custom KDE interface for a Xandros Linux distro. The OS is an example of streamlined, simplistic beauty that either a child or computer newbie could comprehend and begin using immediately. The interface is a combination of Windows and TAB-style navigation with an intuitive categorization of software suites, such as Internet, Work, Learn, Play, Favorites, and Settings. And don't despair, Windows loyalists: The Eee PC is compatible with Windows XP.

There are a number of third-party applications that Asus bundled for each of these software categories. Specifically, OpenOffice provides word processing, spreadsheet, and presentation functions; Firefox handles Web browsing; and shortcuts to Gmail and Yahoo! Mail deliver Web-based email. Asus also installed compatible versions of Skype and Pigeon for instant messaging and VOIP calling. Web browsing with the unit was a little bit awkward for sites that did not support resolutions below 1,024 x 768, because the LCD's native resolution is 800 x 600.

For the money, the Asus Eee PC is an impressive bundle of ultra-portable computing. Not only does it make for an excellent first PC for kids but it also scores high marks with us as an ultra-portable, ultra-affordable notebook. ▲

**by Dave Altavilla**



The Eee PC is all Intel inside, with a 900MHz Mobile Celeron ULV processor, GMA900 graphics adapter, and 910M chipset.

**Eee PC 701 4G**
$399 (as tested)
Asus
www.asus.com
●●●●◖

Specs: 900MHz Intel Mobile Celeron ULV; 512MB DDR2; 4GB SSD; Networking: 802.11g, 10/100 Ethernet; Xandros Linux

**CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT**

Finally, a Maingear performance computer that you can recommend to your friends and family instead of the same boring, bloated, commodity PC. Built with all the care and love we give our tweaked out, hyperactive gaming systems, the Maingear Dash Friends and Family PC is a no compromise solution to a very mainstream problem. We know that not everyone in the world is a gamer, but we can dream, right? So, for those of you who want the world's best service, support, and performance without breaking the bank, we bid you welcome to our family.

1.888.MAINGEAR
WWW.MAINGEAR.COM

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HIGH PERFORMANCE LUXURY COMPUTERS

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Maingear recommends Windows Vista® Home Premium. *System shown with additional accessories.

# Seagate Barracuda 7200.11 1TB

So much for IDE. Seagate leaves the parallel interface behind, along with longitudinal recording, in its latest generation of PMR (perpendicular magnetic recording) terabyte drives.

Seagate's latest, the Barracuda 7200.11 is available in 500GB, 750GB, and 1TB capacities, all with a choice of a 3Gbps or 1.5Gbps SATA interface with NCQ. There's Seagate's Enhanced G-Force Protection against off-duty knocks, dynamic head fly height adjustment, and a full-stroke disk calibration feature called Clean Sweep.

I compared the 7200.11, singly and in a RAID 0, to its ES.2 SATA enterprise version ($419). The ES.2 offers improved resistance to the vibrations found in multidrive servers and uses about 20% less power than the previous generation of ES, according to Seagate. For contrast, I added benchmarks from my review of Hitachi's vaunted Deskstar 7K1000 1TB drive in the June 2007 issue of *CPU*. (See pages 18 to 22.) Take the latter for what they're worth, as they were gathered from a different test system.

Even without a direct comparison, it's clear that the newest generation of PMR drives have vaulted 7,200rpm performance into a new tier. Breaking the terabyte barrier makes for nice headlines, too. You really can't lose with any of these drives, although Seagate wins on price (for the 7200.11, at least) and warranty. In the real world, however, either brand will give you superb speed and awesome capacity. ▲

**by Marty Sems**

**Barracuda 7200.11 1TB**
$329.99
Seagate
www.seagate.com
●●●●

## Terabyte Titans

All specs are as tested. Other models may vary. HD Tach RW and Iometer: unpartitioned drives; PCMark05: NTFS. Scores in brackets: RAID 0.

| | Seagate 7200.11 1TB* [RAID 0] | Seagate Barracuda ES 2 1TB* | Hitachi Deskstar 7K1000 1TB** |
|---|---|---|---|
| Interface | SATA 3Gbps | SATA 3Gbps | SATA 3Gbps |
| Spindle speed (rpm) | 7,200 | 7,200 | 7,200 |
| Cache (MB) | 32 | 32 | 32 |
| Average seek time, as advertised (ms) | N/A | 8.5 read/9.5 write | 8.5 read/9.2 write |
| Shock tolerance, op/non-op (G) | 63 (2ms)/300 (1ms) | 63 (2ms)/300 (1ms) | 70 (2ms)/300 (1ms) |
| Warranty (years) | 5 | 5 | 3 |
| **HD Tach RW 3.0.4.0, Long Bench** | | | |
| Read rates, avg/max (MBps) | 84.9/99 [121.4/138] | 88/107 | 72.7/102 |
| Write rates, avg/max (MBps) | 76.3/95 [111.9/126] | 78.5/95 | 72.6/88 |
| Write rates, avg/max Quick Bench (MBps) | 59.1/74 [112.1/127] | 61.4/77 | N/A |
| Random access (ms) | 12.8 [12.4] | 13 | 13.4 |
| Burst rate (MBps) | 127 [220.1] | 127.7 | 160.5 |
| CPU Utilization (%, +/- 2%) | 4 | 5 | 3 |
| **Iometer 2006.7.27** | | | |
| File Server (IOps) | 71.7 [162.1] | 65.6 | 95.2 |
| Web Server (IOps) | 127.8 [280.7] | 120.9 | 120.4 |
| **PCMark05 1.2.0** | | | |
| HDD Score (points) | 6187 [7175] | 6102 | 6879 |
| XP Startup (MBps) | 8.9 [14.1] | 8.6 | 10.4 |
| Application Loading (MBps) | 7.4 [7.8] | 7.2 | 8.8 |
| General Usage (MBps) | 6.7 [8.4] | 6.5 | 7.8 |
| Virus Scan (MBps) | 92.1 [86.2] | 90.7 | 110.5 |
| File Write (MBps) | 91.6 [99.1] | 95 | 80.1 |
| Price | $329.99 | $419 | $399 |
| **CPU Rating** | ●●●● | ●●●● | ●●●● |

*Core 2 Duo E6700 2.67GHz, 2GB DDR2 (1,066MHz), Intel D975XBX2KR, Radeon HD 2600 XT, Vista Home Premium
**Core 2 Extreme QX6700 2.67GHz, 2GB DDR2 (1,066MHz), Evga Nforce 680i SLI, GeForce 7900 GTX, Vista Home Premium

**Specs:** 27 to 29dB; 4 disks

**CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT**

# Ridata 1.8” IDE Solid State Disk

SSDs are more of a boon to mobile devices and servers than to desktop PCs thus far, so here’s a 16GB NAND-SLC (single-level cell) model in the 1.8-inch form factor. It isn’t as fast as the 2.5-inch Mtron SSDs I tested in the November 2007 issue of *CPU* (see page 34), but it will provide portable devices with relatively whip-cracking data accesses, high shock tolerance, and low power consumption. Ridata mentioned that the SSD will fit into mobile PCs such as the Samsung Q1 and NP-Q1, along with Motion Computing’s LS800, LE1600, and LE1700.

I didn’t have any 1.8-inch hard drives on hand for a direct comparison within the form factor, but I did find a 2.5-inch Seagate ST9160823ASG. Note that the Ridata uses a female, 44-pin ATA connector that physically resembles CompactFlash’s, like an iPod’s hard drive. I connected it to a standard 39-pin IDE cable using Addonics AAT18IDE25 and Rosewill RCW-603 adapters.

This SSD had the edge in boot time and power consumption but ceded the general performance crown to the notebook hard drive. Mind you, the Ridata would look better next to a 1.8-inch hard drive with a slower rotational speed. ▲

**by Marty Sems**

**1.8” Solid State Disk**
$399
Ridata
www.ritekusa.com
●●●◖

**Specs:** 44-pin female (1.8-inch) Ultra DMA 100Mbps connector; 3.3V; 6mA to 120mA power consumption; Reed-Solomon ECC; dynamic wear-leveling; 4 million-hour MTBF; 2 million-cycle write endurance

| Benchmarks Results | Ridata 16GB SSD 1.8" | Seagate Momentus 7200.2 160GB 2.5" |
|---|---|---|
| Interface | 44-pin female (1.8-inch) IDE | SATA |
| **1.5GBps (w/ NCQ)** | | |
| Boot to desktop* (min:sec) | 0:55 | 1:10 |
| PCMark05 1.2.0 (points) | 5545 | 5949 |
| HDD Score (points) | 2779 | 4647 |
| XP Startup (MBps) | 5.7 | 7.9 |
| Application Loading (MBps) | 4.4 | 5.9 |
| General Usage (MBps) | 3.7 | 4.7 |
| Virus Scan (MBps) | 34.3 | 81 |
| File Write (MBps) | 21.7 | 50.1 |
| **HD Tach RW 3.0.4.0, Long Bench** | | |
| Read rates, avg/max (MBps) | 37.7/39 | 47.8/63 |
| Random access time* (ms) | 0.9 | 14.2 |
| Write rates, avg/max (MBps) | 30.5/34 | 44.2/57 |
| Burst read rate (MBps) | 40.6 | 130.5 |
| CPU Utilization* (% +/- 2%) | 1 | 2 |
| **Iometer 2006.07.27** | | |
| File Server (IOps) | 212.9 | 89.7 |
| File Server (MBps) | 2.3 | 1 |
| File Server avg/max response* (ms) | 75.1/311.4 | 178.3/475.3 |
| Web Server (IOps) | 1492.44 | 109.4 |
| Web Server (MBps) | 23.1 | 1.6 |
| Web Server avg/max response* (ms) | 42.9/170.2 | 584.1/1312.3 |

Test system: Vista Home Premium, Core 2 Duo E6700 2.67GHz, 2GB DDR2 (1,066MHz), Intel D975XBX2KR, Radeon HD 2600 XT

* Lower is better.

# AMD Athlon 64 X2 5000+ Black Edition

As much as we like to hear about the latest quad-core processors, only a select few can afford the $1,000+ price tags. The majority of us tend to buy CPUs with prices that fall in the mid- to lower-end of the price scale, where the best values lie. And, there’s always a good chance those processors will overclock to yield performance similar to much more expensive parts.

If you’re the bargain-hunting, overclocking type, AMD quietly released a new dual-core processor that is sure to pique your interest. On the surface, the AMD Athlon 64 X2 5000+ Black Edition seems much like the plain vanilla 5000+ that’s been on the market for ages. But the Black Edition’s standout feature is its unlocked multiplier. This lets overclockers experiment with higher core frequencies without running other components out of spec.

I plugged the 5000+ Black Edition into an Asus CrossHair mobo and was able to overclock it to 3.3GHz with nothing but a voltage bump to 1.5V and few tweaks to the multiplier and HT frequency. And its overclocked performance is right up there with the fastest X2s. If you aren’t quite ready for a system overhaul, the 5000+ Black Edition could be a fun upgrade without having to shell out much coin. ▲

**by Marco Chiappetta**

**Athlon 64 X2 5000+ Black Edition**
$129
AMD
www.amd.com
●●●●

**Specs:** Socket AM2; Clock speed: 2.6GHz; HyperTransport Link: 2GHz; 65nm process; Cache: 1MB L2 (512K per core), 256K L1 (128K per core); Voltage: 1.25V/1.35V; 65W TDP

| Benchmark Results | |
|---|---|
| **SiSoft SANDRA XIIc 2008** | |
| *Processor Arithmetic* | |
| Drystone ALU (MIPS) | 18,956 |
| Whetstone iSSE3 (MFLOPS) | 15,894 |
| *Processor Multimedia* | |
| Integer (iitps) | 49,146 |
| Floating Point x4 iSSE2 (fitps) | 53,551 |
| *Memory Bandwidth (Buffered)* | |
| RAM Bandwidth Int. iSSE2 (MBps) | 7,316 |
| RAM Bandwidth Float iSSE2 (MBps) | 7,274 |
| **Futuremark PCMark05** | |
| CPU Performance Module | 5337 |
| Memory Performance Module | 4772 |
| **LAME MT** | |
| Single-Threaded (min:sec) | 1:17 |
| Multithreaded (min:sec) | 0:50 |
| **F.E.A.R. v1.08** | |
| 640 x 480 (Low Quality) | 209fps |

**CPU RANKING** ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Take the lead with Antec's TruePower Quattro™! With up to 1000 Watts and four 12V outputs, the stylish and compact Quattro efficiently provides stable and reliable power for your powerful processors and multiple graphics cards. The TruePower Quattro™ is designed to meet the 80PLUS® certification which means that it consumes about 33% less energy than many equivalent power supplies, without any reduction in quality performance! All modular cables are sleeved and labeled to give your system a clean and professional look, and the racing stripe paint job adds the extra flair you need to leave everyone else in the dust. For more information, visit **www.antec.com**.

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by Anand Lal Shimpi

# Kitty Musings: Leopard

Interest in the latest version of Mac OS X is understandably quite high. While 10.5 (code-named Leopard) isn't nearly the revolutionary change that 10.4 (Tiger) was before it, it's really Leopard's timing that has done most of the marketing for the OS. It's the first major Apple release since the iPhone, a device that lured a number of non-Mac users into the Apple fold. Just as significant, however, is the fact that Leopard is the first Mac OS released after Vista.

As such, comparisons with Vista are inevitable, and having just left the gates, Leopard isn't as finicky as Vista was in its first days. One big reason for this is that the game compatibility and performance issues that plagued Vista early on just aren't a problem in Leopard, as Mac OS isn't really a gaming platform.

That said, Leopard does have its share of issues. You've probably heard about the major ones (such as Leopard's file move bug), but some of the unmentioned ones include things like choppy mouse behavior under a lot of I/O load (something that didn't happen under Tiger). Compared to the first release of Tiger, Leopard is far better off in the bugs department, but I'd expect to see some major fixes in 10.5.1 and beyond.

While Vista caught up to OS X in a number of ways, Leopard seems to ignore Vista and sticks to its own evolutionary path. Features such as ReadyDrive, ReadyBoost, and hybrid hard drive support in general are absent from Leopard, and that's actually not a bad thing. Although promising, those technologies don't really do much in Vista PCs today, and it makes sense for Apple to wait on things that don't provide real performance boosts right now.

One of the simplest yet arguably biggest features of Leopard is Time Machine, OS X's new built-in, real-time backup system. Put simply, the most attractive element of TM is that it just works. All you need is a spare internal or external hard drive; mark part or all of it as a backup drive and you're done. While the first backup takes seemingly forever, each subsequent backup is considerably shorter. Every hour TM will back up only changed files and keep those hourly backups for 24 hours. TM also keeps daily backups for the past month and weekly backups on top of that. Restoring data is even easier with TM's fully functional finder. The UI lets you navigate files and folders while simultaneously letting you navigate along the axis of time. The end result is a backup system that you're more likely to use, provided that you spring for the extra hard drive. It would even make sense for Apple to begin shipping higher-end Macs with two drives to take advantage of Time Machine.

*Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in* USA Today, *CBS' "48 Hours," and* Fortune. *His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.*

Visually, Leopard is a huge departure from Tiger, and when using the two OSes back-to-back, Leopard feels newer. The changes are subtle but plentiful; in many ways, the Tiger-to-Leopard shift is akin to going from Jaguar to Panther (10.2 to 10.3). Unfortunately, newer isn't always better, and some of the changes have been met with mixed reactions. The reflective Dock was hacked and reverted to its original form before Leopard even went on sale. There is far more visual uniformity in 10.5 than there was in Tiger—nearly all of the apps finally look alike. There's still room for improvement, and history suggests it will come. OS X 10.1 was visually impressive for its time but evolved over time into something even more polished, and it's safe to assume that the visual changes in 10.5 are merely a starting point, as well.

So far, Mac OS X has gotten faster with each release. Much to my amazement, even Tiger showed a real performance bump over Panther, but there's no way Apple could do it four times in a row, right? Technically, Apple did. Most of my tests show Leopard equaling Tiger or slightly beating it, and then there's the less-than-scientific seat-of-the-pants feel, which definitely improved. There are a couple of areas where Tiger is faster, such as file copy operations, but overall, Leopard performs on par with Tiger.

If you're a Mac user with a decently fast Mac, does Leopard make sense? Of course. If you're a PC user, Leopard doesn't really make the Mac platform any more or less attractive. If you're looking for less commitment than a full switch, grab some old hardware and visit osx86project.org. ▲

**Talk back to Anand at anand@cpumag.com**

## The Shark Tank

by Alex “Sharky” Ross

# Nvidia’s Impressive GeForce 8800 GT

Let’s face it, the competition at the top of the GPU wars is and has for a long time been dominated by Nvidia. The company’s G80-based Geforce 8800 GTX and Ultra have sat at the top since their introduction and really haven’t faced anything of substance to date. There simply is no challenge from AMD/ATI on that front. However, looking down the scale to the middle-weights (mid-range sector), where the real money is made, the choice isn’t quite as clear. AMD/ATI actually has a stellar part available in the Radeon HD 2900 XT, which stacks up extremely well against Nvidia’s 8800 GTS for DX9- and DX10-based titles in the $250 range. So what better time to introduce a new GPU core, dubbed the G92? If you were expecting that introduction to be at the high end, you would be wrong. . . . The mid-range now has a new champion in the Geforce 8800 GT, based upon the new (sort of) G92 architecture.

Along with a die-shrink to 65nm, the G92 sports much of a G80 core (with some goodies turned off) and has even more transistors than before, some 754 million. Not that the 681 million was ever considered a small amount, but for G92, Nvidia chose to integrate its updated video-processing engine (VP2) and display engine into the core, and hence tallied up those transistors. The VP2 video-processing engine serves up AES128 decryption for HDCP content and full hardware acceleration (motion compensation, bitstream processing, etc.) for H.264 content, as well.

The GPU clock is set to an impressive 600MHz and the shader clock to 1,500MHz, which is up from the 8800 GTX’s 575MHz and 1,200MHz, respectively. With a fill rate of 33.6GTps, a 256-bit memory interface with 512MB, 57.6GBps worth of memory bandwidth, and 112 stream processors (minus one of the SP units from the G80), the theoretical paper specs make for an interesting “dyno” sheet, if you will. Being somewhat small in stature on a single 9-inch PCB, the 8800 GT is also primed for a dual-card SLI setup. In single or SLI mode and running the DX10-based Bioshock tests in 1,600 x 1,200, the 8800 GT actually outperformed an 8800 GTS. In single mode, the 8800 GT churned out an impressive 68.4fps vs. the 8800 GTS’ 59.7fps, with the Radeon HD 2900 XT lagging behind at 55.3fps. Everyone’s favorite, yet performance-hogging, Crysis demo test showed the 8800 GT at 36fps vs. the Radeon 2900 XT’s 25fps at 1,280 x 1,024.

Also worthy of note is the new driver set which comes with the release of this new hardware. Nvidia has a new transparency multisampling algorithm included in the 167.37 drivers (go ahead and download them since the feature works with other GeForce 8 series cards) to improve image quality that replaces the previous TRMS anti-aliasing mode.

When it comes to “future-proofing,” video cards have always been an oxymoron. But Nvidia is still first to bat with the PCI Express 2.0 5Gbps serializer/deserializer standard. Sometime in the future, with more demanding games, that extra bandwidth may come in handy. But as you’d expect, the 8800 GT is backward-compatible with today’s platforms. Speaking of the future, there is a small blip in the radar from AMD/ATI, and as far as I can make out, it looks like the as-yet unreleased RV670 GPU is rumored to be a 55nm chip harboring some 700 million transistors.

With a little bit of “trickle down” from the high-end, a smaller new 65nm process, and some core tweaks, what Nvidia now brings to the table is a $200 to $250 part that, simply put, destroys anything 2900 XT had in the performance department. Any gamer on somewhat of a budget needn’t look to any other graphics card—the 8800 GT (whether from Asus, BFG Tech, or some other OEM) is the card of choice. Period. ▲

**Email me at sharky@cpumag.com**

*Disrupting Reuters’ newswire with a cheery Christmas greeting at age six, Alex “Sharky” Ross became an avid computer user/abuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently overclocks/tunes Porsche 996 Turbos with www.sharkwerks.com when he’s not tweaking PCs.*

1000$^{+}$ hours of R&D, 800$^{+}$ hours of Torturous lad and real world testing and endless$^{+}$ hours of brains-storming. The end result? Latest addition to the chassis family of high-perforcemance, The Xaser VI & Armor Plus. The world's first chassis with a 10 PCI Slot design that can take on multi-graphic-cards configuration of the future. Not to mention retractable top, intelligent cable management, quick connect & release HDD canister... and the list of features that makes your life a little easier goes on and on. So why not come see for yourself at www.thermaltakeusa.com and learn about what it takes to lead$^{+}$.

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# PC Modder

## Tips & Tutorials

Modding does the body good. A PC's body anyway, inside and out. Here you'll find hardware, firmware, tools, tips, and tutorials for modding your rig's performance and appearance. Send us your own mod-related tips and ideas at modding@cpumag.com.

## Mods & Ends

### Zalman VF1000 LED

If your graphics card is too noisy or you want to boost its cooling performance for some overclocking adventures, Zalman has a new product available that's sure to pique your interest. The company's VF1000 LED cooler ($49.99) features Zalman's patented VFP (Variable Fin Profile) technology and has a thin, 80mm fan installed inside the body of the heatsink to maximize cooling performance. The VF1000 LED's oversized heatsink is made up of 0.3mm-thick, pure copper thin fins, and the unit's milled base is connected to the heatsink via four high-performance heatpipes for excellent thermal transfer.

The Zalman VF1000 LED is designed to cool not only the GPU but also the RAM and other components on the front side of most graphics cards. And thanks to a wide array of included mounting hardware, the unit is compatible with a broad range of Nvidia- and AMD-based graphics cards, including the GeForce 8800 and Radeon HD 2900 series. 8800s require the purchase of a separate memory cooler, however. The VF1000 LED also includes separate memory heatsinks, thermal paste, and a fan controller that gives users the ability to switch between silent (18dBA) and normal (28dBA) modes.

The near-silent Zalman VF1000 LED is compatible with a wide array of graphics cards and offers superior performance to most stock coolers.

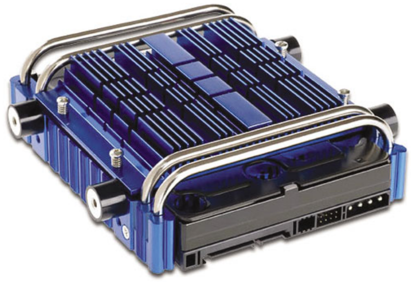
### Nzxt Sentry 1

There are a myriad of fan controllers on the market, but few offer the simple elegance of the Nzxt Sentry 1.

We've seen our fair share of fan controllers over the years, many of which were part of elaborate multifunction drive bay inserts that incorporated a wide array of features. But for those who prefer an elegant-looking, easy-to-use fan controller to all of the bells and whistles of a multifunction panel, Nzxt has the answer. The Sentry 1 fan controller ($22.99) is designed to fit in any standard 5.25-inch drive bay. The unit is made of aluminum and features a large LCD that displays temperatures for the CPU, GPU, and hard drive. It also has the ability to control two fans (with 3-pin connectors), features time and temperature alarms, and displays hard drive activity.

### Ultra 3.5" Aluminum Hard Drive Cooler With Heatpipes

Hard drives can be one of the noisiest components in a PC, and high-speed models are also known to generate quite a bit of heat. To combat both of these problems, Ultra Products has released its 3.5" Aluminum Hard Drive Cooler with Heatpipes ($42.99). The Ultra 3.5" Aluminum Hard Drive Cooler features a large aluminum heatsink linked to two aluminum blocks on either side, and four sintered powder heatpipes connect to the blocks. A hard drive is installed underneath the large heatsink, and the entire assembly installs in a 5.25-inch drive bay using four rubber grommets. The grommets isolate the drive to reduce noise and vibrations.



Ultra's 3.5" Aluminum Hard Drive Cooler with Heatpipes makes your hard drive run cooler and quieter.

## Fashionably Fresh Firmware

### Apple MacBook EFI Firmware Update (v1.1)

A recently released EFI firmware update bolsters the reliability and performance of Intel Core 2 Duo processors and fixes problems with Boot Camp running on MacBook systems.

www.apple.com

### ATI TV Wonder Digital Cable Tuner (v1.16H)

An update for the ATI TV Wonder Digital Cable Tuner resolves a number of issues, including one where Windows Media Center wouldn't always detect the tuner after the computer resumed from sleep mode (which resulted in the loss of scheduled recordings). It also improves M-Card reliability on some cable networks.

www.amd.com

### AOpen DSW1812PL (vSA32)

AOpen updated the firmware for its DSW1812PL to improve the drive's read and write performance with different types of recordable media.

www.aopen.com.tw

**by Marco Chiappetta**

www.lian-li.com

# Aluminum Case

Design to be cool

PC-A71

PC-A70

## SERVER CASE

HDD anti-vibration rubber rings.
Removable/washable fan filter.
HDD cage can be turned 180 degree.
VGA card pillar extension.

- Device: 5.25" bay x5, 3.5" internal x10(removable x3)
- Fan: 12cm ball bearing fan x6 (Fan speed:1500 rpm)
- M/B type: EXT ATX (max size: 12"x13")
- Top I/O: USB2.0 x 2, IEEE1394 x 1, MIC x 1, EAR x 1
- Dim:220x595x590mm (W,H,D) PC-A70
- Dim:220x595x615mm (W,H,D) PC-A71

## PC-A01 MINI TOWER

### Lian li originate design: Fan less

Can be placed vertically or horizontally.
CD-ROM easy assembling module.
Spare 8cm fan mount.
Magic space for 28cm VGA card.
Movable plate with spare CPU cooler.

- Device: 5.25" bay x1, 3.5" bay x2, 3.5" internal x1
- Fan: None; spare for 8cm fan mount x1
- M/B type: Micro ATX (max size: 9.6"x9.6")
- P/S type: Standard ATX Power
- Top I/O: USB2.0 x 2, IEEE1394 x 1, MIC x 1, EAR x 1
- Dim: 160x360x410mm (W,H,D)

## PC-B25 CLASSICAL SILENT

### Double-layer designed side panel

HDD cage can be turned 180 degree,
in order to marshal wires.
Blue lighting design for the front panel.

- Device: 5.25" bay x3, 3.5" bayx1, 3.5" internal x5
- Fan: 12cm ball bearing fan x3 (Fan speed:1500 rpm)
- M/B type: ATX (max size:12" x 9.6")
- Top I/O: USB2.0 x2, IEEE1394 x1, MIC x1, EAR x1
- Dim: 210x450x515mm (W.H.D)

**LIAN LI INDUSTRIAL CO., LTD.** Tel: 886-2-2451-3000 Fax: 886-2-2452-5659 www.lian-li.com

# Uncommon Liquid-Cooling Mods

## Go Beyond Your CPU & GPU

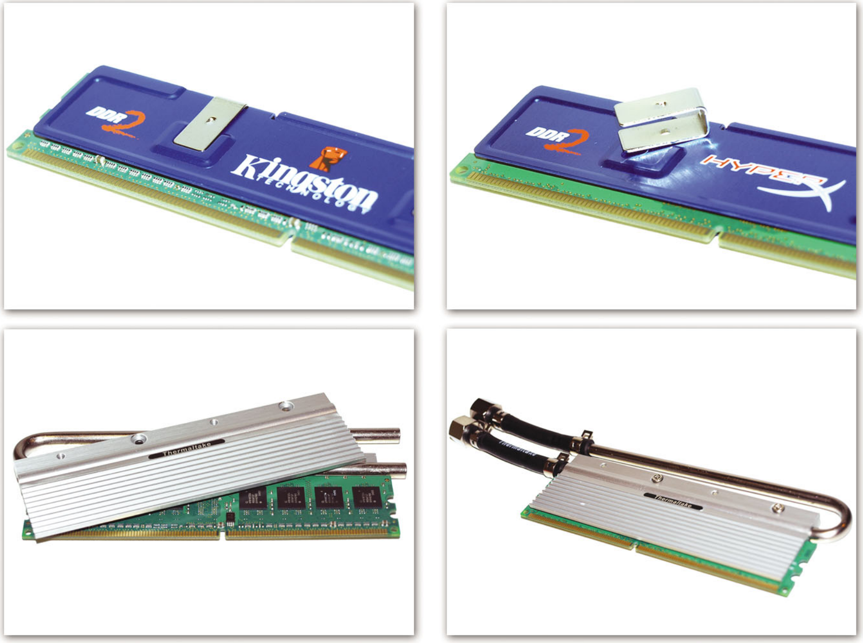
There's a common misconception that liquid-cooling the hottest-running components in a system, typically the CPU and GPU, means case fans are no longer necessary. The reality is that many things inside a PC rely on the constant air circulation from case fans and residual air flow from a CPU cooler to remain within operating temperatures. If you install waterblocks on only the CPU and GPU and eliminate air flow from within a system altogether, the motherboard's chipset or VRM could overheat. Your system's RAM/hard drive could also be damaged over time.

Even the most elaborate liquid-cooled rigs should have at least some air circulating through their case to ensure stability and longevity. But there is something you can do to reduce the need for fans. By cooling more of the components within the system with liquid, you minimize the need for noisy case fans. The problem with this approach is that many liquid-cooling kits don't include provisions for cooling components such as RAM, a hard drive, or a chipset. Waterblocks for these components are readily available from a number of popular manufacturers, though, and incorporating them into a liquid-cooling system is quite easy.

With the popularity of liquid cooling, we thought it would be a good idea to show you what it takes to liquid-cool a chipset, some RAM, and a hard drive. These may not be the most commonly liquid-cooled components in a system (and they do require you to take extra steps during the installation processes), but bringing them "into the loop," so to speak, isn't very difficult.

### Ready For More?

Before you begin to incorporate one or more of these items into your liquid-cooling system, there are a few things to consider. First, be certain the waterblocks you purchase include barbs or fittings that match the tubing in your liquid-cooling kit. If they don't include the correct fittings, you won't be able to connect the waterblocks to your tubing. Second, make sure you have enough tubing to easily create a loop for all of your waterblocks; you don't want to stretch or kink any of the tubing. Also, double-check that the pump being used is powerful enough to force liquid through the entire system. A quality pump with a 200gph (gallons per hour) or higher flow rate with a PSI rating of 30 or higher



Liquid-cooling system memory may require removing factory-installed heat spreaders, which will likely void the manufacturer's warranty. Exercise care at this crucial step.

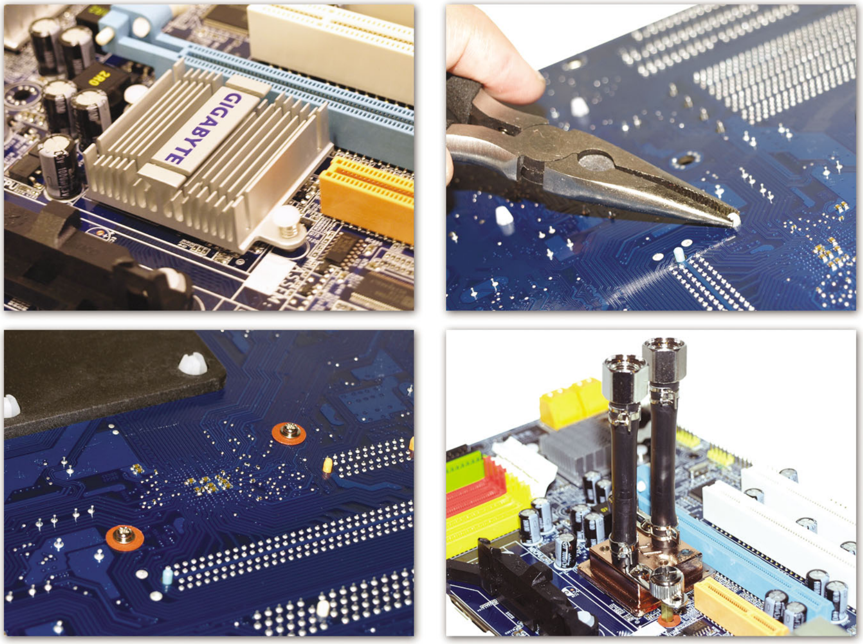
should do the trick. And finally, use a good-sized radiator with 80 or 120mm fans so you won't have any trouble dissipating the additional heat.

## RAM Refreshments

Actually installing a waterblock on a DIMM is a fairly straightforward process. Preparing the DIMM for the waterblock installation, however, can take a bit of work. Most of today's high-performance memory features factory-installed heat spreaders that can be somewhat difficult to remove. We should warn you that you run the risk of pulling a memory chip off the DIMM doing this and obviously voiding your warranty. For our project, we used a stick of Kingston HyperX DDR2 memory. Because the Kingston DIMM featured aluminum heat spreaders held in place by not only a strong adhesive but also metal clips, we consider this example a worst-case scenario.

To begin, use a small flathead screwdriver to carefully pry up the metal clips holding the heat spreaders in place. It won't require a lot of force, and the clips will disengage fairly easily. Once the clips are off, if you're lucky, the heat spreaders will pop off when you try to peel them back. If not, you'll have to pull them apart carefully. You don't want to manhandle the DIMMs, but it can take a good amount of force to pull the heat spreaders away if the memory manufacturer used a strong adhesive.

It's best to start on one side and pry the heat spreader up, one chip at a time. You'll be tempted to use a screwdriver to pry the heat spreaders off; we'd recommend against this because you run the risk of nicking a trace on the PCB or knocking off a surface-mounted component, both of which could irreparably damage the DIMM. We'd suggest sticking a business card (or something similar) in one edge of the DIMM to protect the underlying PCB and pulling the heat spreader off from the other edge. If you apply firm, even pressure, the sticky adhesive should break loose from each memory chip. It'll become easier as fewer attached chips remain. We didn't rush this process with our memory and thankfully didn't damage any DIMMs doing this mod.



Installing a waterblock on a northbridge or southbridge could pose clearance problems on some motherboards. On this Gigabyte motherboard, for example, the waterblock is in the path of an expansion slot, which prevented the use of full-length expansion cards.

As a precaution, once you've removed the heat spreaders, pop the memory back into your system to make sure it's still working. It would be incredibly frustrating to completely assemble the waterblock, only to find the memory has been damaged in the process. If your memory checks out, take the memory back out of the system and clean the exposed chips of any residue or oils left over from the heat spreader's TIM (thermal interface material). When the chips are clean, you can insert the DIMMs into the waterblock.

Preparing the waterblock is simple. Although they differ from manufacturer to manufacturer, memory waterblocks will typically have two halves that screw together to sandwich the DIMM. Take each half of the waterblock and prepare their surfaces according to the manufacturer's specifications. Our Thermaltake kit required installing long thermal pads on each side of the waterblock and a tube that carries the liquid. We applied the thermal pads and used thermal paste to line the channel along the top of each side of the waterblock. Finally, we centered the DIMM in the assembly and locked everything in place by tightening the screws on each side. At this point, we were ready to attach the tubing and fittings.

## Chipset Chillin'

Some high-end motherboards from Asus have begun including hybrid air/liquid-cooling northbridge blocks that'll work with just about any liquid-cooling system. But if you don't have one of these boards, installing a chipset waterblock of your own is fairly easy.

For our example, we used a Gigabyte AMD690G-based motherboard, but the process should be similar for almost every manufacturer's boards. First, inspect the board and make sure the waterblock will fit in place of the stock heatsink. Occasionally there will be closely-situated capacitors that could prevent you from installing an aftermarket block. On our board, installing the waterblock meant sacrificing the first slot on the board (usually a PCI-E x1

To prevent damaging the hard drive, be sure you don't cover any ventilation holes when installing a liquid-cooling system. The ventilation holes are usually very small and are tagged with a "Do not block" label.

slot, but in our case, an x4 slot) or, at best, limiting its use to unusually short expansion cards.

The first step to installing a chipset waterblock is removing the stock motherboard heatsink. With our motherboard, we had to flip it over to disengage a couple of plastic push pins. The heatsinks on some motherboards will be screwed in place; on others, metal clips on the top side hold the heatsink in place. We used a pair of needle-nose pliers to remove the push pins from our board. We squeezed the clips together and pushed them through the mounting holes. Then, we flipped the board over, pulled off the heatsink, and cleaned the remaining residue off the chip.

To mount the chipset waterblock, we fed two extra-long screws up through the existing mounting holes on the motherboard. We placed a washer on each screw before we inserted the screws and used brass nuts to hold the screws in place.

At this point, we addressed the waterblock itself, which included a pair of adjustable, swinging arms that needed to be aligned with the mounting screws. It was simply a matter of loosening a couple of screws, fitting the waterblock, and tightening the screws. With that done, we applied a bit of thermal paste to the motherboard's chipset, set the waterblock in position, and secured it in place with included thumbscrews. For the final step, we slid a couple of pieces of short tubing with the appropriate fittings over the barbs on the block, and then we held the tubes in place with a couple of spring clamps.

## Chilled Hard Drive

Installing a waterblock onto a hard drive was the simplest job of the three. We didn't need to disassemble anything, but there were a couple of things we needed to look out for. On both the top and underside of most hard drives, there are tiny ventilation holes that cannot be covered up. If you look closely, they'll usually be marked by an arrow and may have a label that says "Do not block." When installing a hard drive into a waterblock, be wary of these holes; you may have to cut away some TIM to ensure they're free of obstruction.

As usual, we began by cleaning the surface of our hard drive. Then, we used a pair of scissors to cut a piece of foam TIM (which was included with our waterblock) to fit the hard drive. Once the foam was cut to size, we pressed it down firmly on the hard drive to ensure it wouldn't slip out of place and then lowered the waterblock down onto the drive. The block was held in place by four screws that lined up with the mounting holes on the underside of the hard drive. With the screws tightened, we could then mount the entire assembly into any open 5.25-inch drive bay. This particular unit from Thermaltake came with fittings pre-installed and included adapters for different-sized tubing.

## Do The Plumbing

If you plan to incorporate these mods into an existing liquid-cooling setup, you'll have to drain the system and route additional tubing to the new waterblocks. It's best to run tubing from the water pump to the hottest-running component. Then run tubing to the next hottest component, and so on. If that's not possible, it's not the end of the world, but performance won't be optimal. While routing the tubing through your system, take special care not to stretch or kink the tubing. When installed, the tubing should be as short as possible but long enough that there are no sharp angles. And, as always, we suggest testing for leaks *before* applying power to your entire system. The last thing you want to do is fire everything up only to find that water is being sprayed all over your hardware.

By bringing more of your system's components into a liquid-cooling loop, you'll minimize the need for case fans. And, at the same time, those components will usually benefit from lower temperatures. We still wouldn't recommend eliminating case fans from a system altogether, because there are still many chips in a PC that need to be cooled to function properly. ▲

**by Marco Chiappetta**

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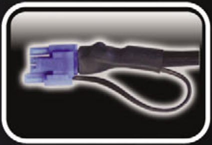

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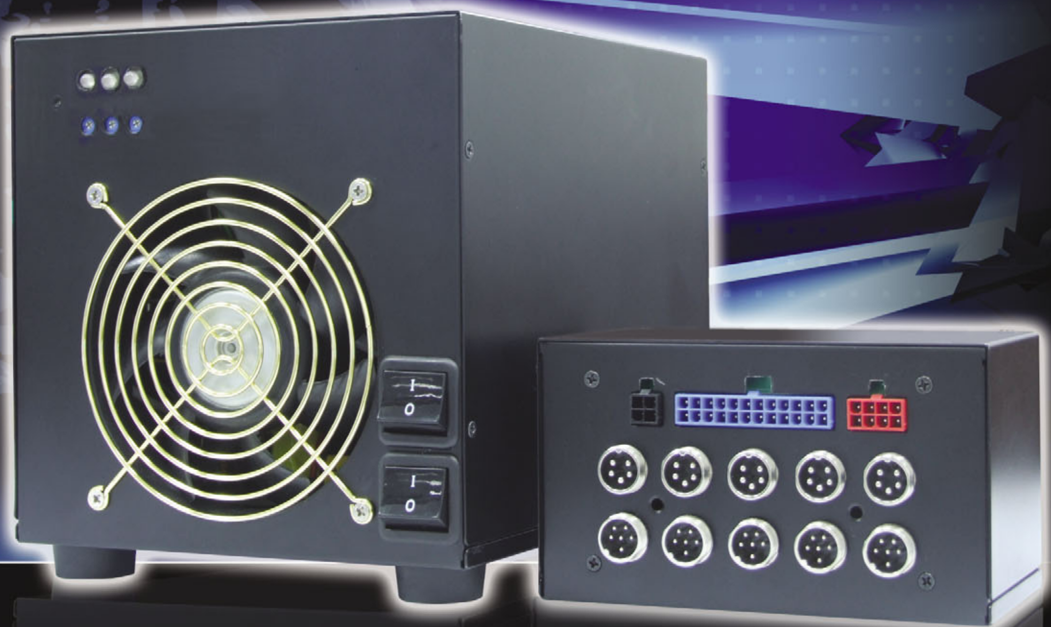

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# Mad Reader MOD

## Biomechanical

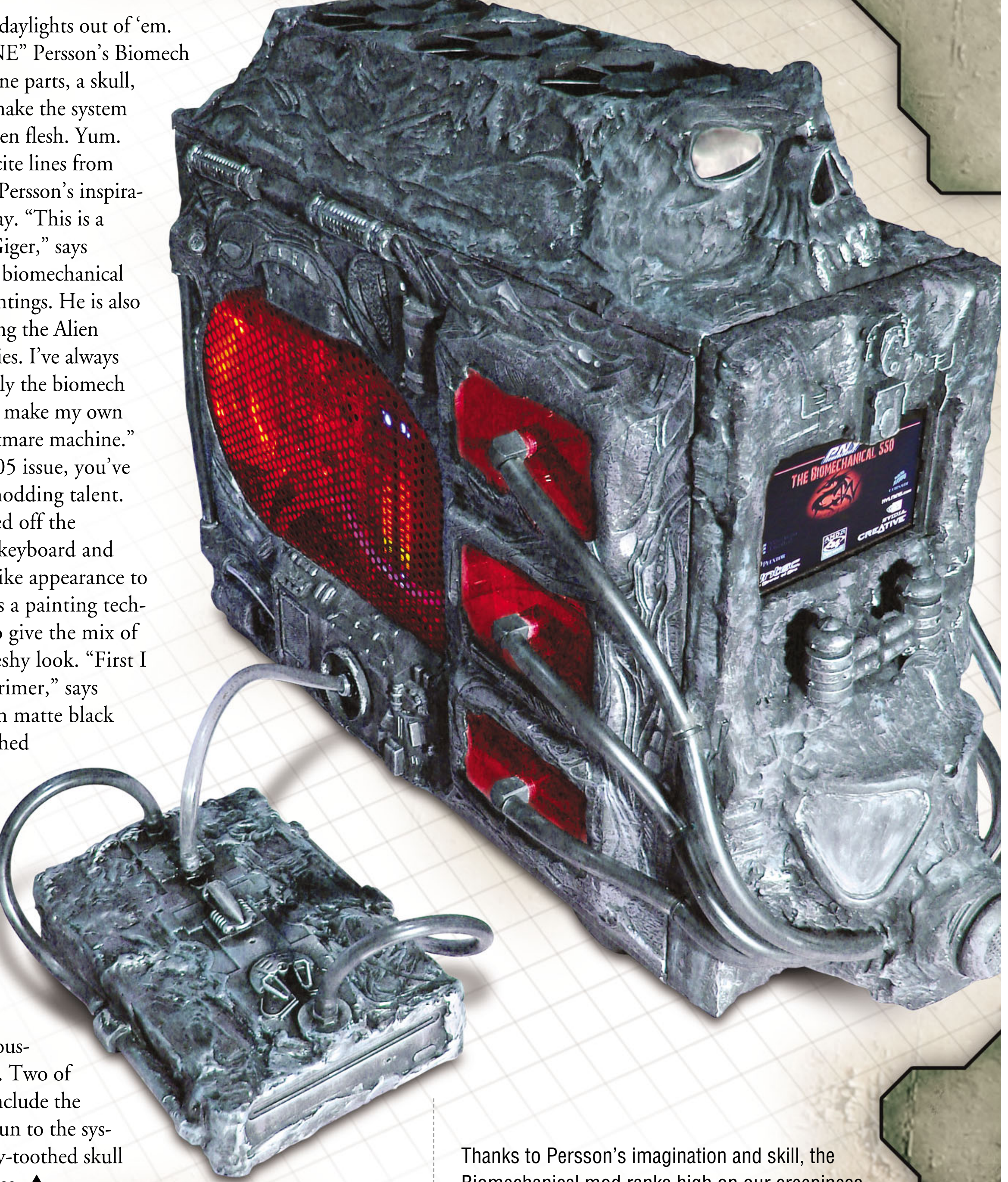
If you can't beat 'em, scare the daylights out of 'em. Magnus "[WP@]WOLVERINE" Persson's Biomech 550 sports dozens of faux machine parts, a skull, and enough sculpting putty to make the system look as though it's covered in alien flesh. Yum.

Those of us who routinely recite lines from the "Alien" series will recognize Persson's inspiration for this spooky rig right away. "This is a tribute to an artist called H.R. Giger," says Persson. "He is the father of the biomechanical style, and he has done many paintings. He is also the artist responsible for designing the Alien monster in the 'Alien' movie series. I've always been a fan of his art and especially the biomech style, and so I wanted to try and make my own version of a biomechanical nightmare machine."

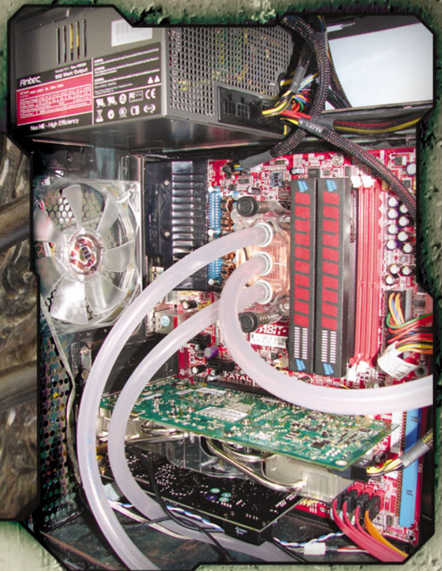
If you've read our March 2005 issue, you've already experienced Persson's modding talent. The Puzzlebox PC, which played off the "Hellraiser" movies, featured a keyboard and mouse that had a similar flesh-like appearance to the Biomechanical. Persson uses a painting technique known as dry brushing to give the mix of putty/model parts its creepy, fleshy look. "First I coated everything with a grey primer," says Persson. "Then I covered it with matte black paint, and after that, I dry-brushed the surface with brown, dark red, white, grey, and silver to get the details I wanted."

As he has with past mods, Persson was careful not to let his artistic vision interfere with its functionality. In fact, it offers a feature you won't find in many computers: an integrated LCD. The modder also created a custom housing for the external optical drive. Two of our favorite props in this mod include the gas mask, which has tubes that run to the system's hard drives, and the pointy-toothed skull that crowns the Biomech 550 case. ▲

**by Joshua Gulick**



Thanks to Persson's imagination and skill, the Biomechanical mod ranks high on our creepiness scale. "There are four red CCFLs inside the case that gives the inside a red glow," says Persson.



“Dry brushing is when you use a brush with very little paint in it and brush the surface, barely touching it, so that parts that stick out get painted but the rest remains as it is,” Persson says. “I got the effect by using different colors and applying different amounts of pressure while dry brushing.”

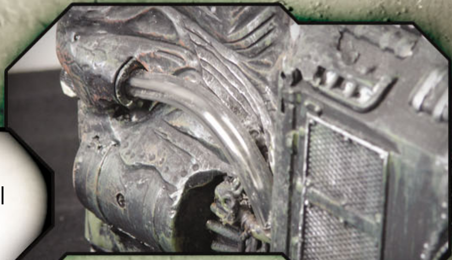
As he has with his previous mods, Persson paid special attention to the cables inside the case. He tucked most of the cables neatly out of sight and routed the four SATA cables together.

The system’s new LCD prevented Persson from putting the DVD±RW into the system, so he moved it outside the case. The drive’s shell continues the biomechanical theme.

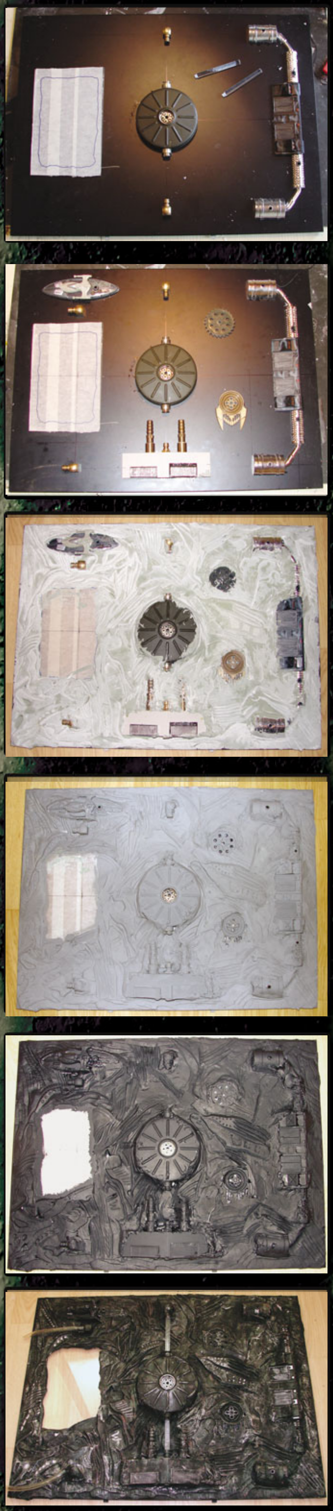
A skull-shaped candle holder sits in front of the three-fan radiator at the top of the case. If that’s not creepy enough, the skull has two particularly long teeth.

## Give Us Your Mod

Have a computer mod that will bring tears to our eyes? Email photos and a description to madreadermod@cpumag.com. We’re looking for rigs that are recognizable as PCs; your Wookiee mod won’t find a home here. If we include your system in our “Mad Reader Mod” section, we’ll help you load up your modder’s toolbox with $1,500 and a one-year subscription to *CPU*.



“All the external tubes that you can see are pure decoration and have no function other than to look cool,” Persson tells us.



“I took all kinds of parts from old model kits: warships, tanks, motorcycles, Lego pieces, and old hose fittings,” says Persson. “Afterwards, I glued the parts in place, covered the entire side in putty, and then let it set.”

# advanced Q&A corner

Get informed answers to your advanced technical questions from *CPU*. Send your questions along with a phone and/or fax number, so we can call you if necessary, to q&a@cpumag.com. Please include all pertinent system information.

> “This card will run circles around your Radeon X1950 Pro, and do so consuming about the same amount of power.”

*Each month, we dig deep into the mailbag here at* CPU *in an effort to answer your most pressing technical questions. Want some advice on your next purchase or upgrade? Have a ghost in your machine? Are BSODs making your life miserable?* CPU*’s “Advanced Q&A Corner” is here for you.*

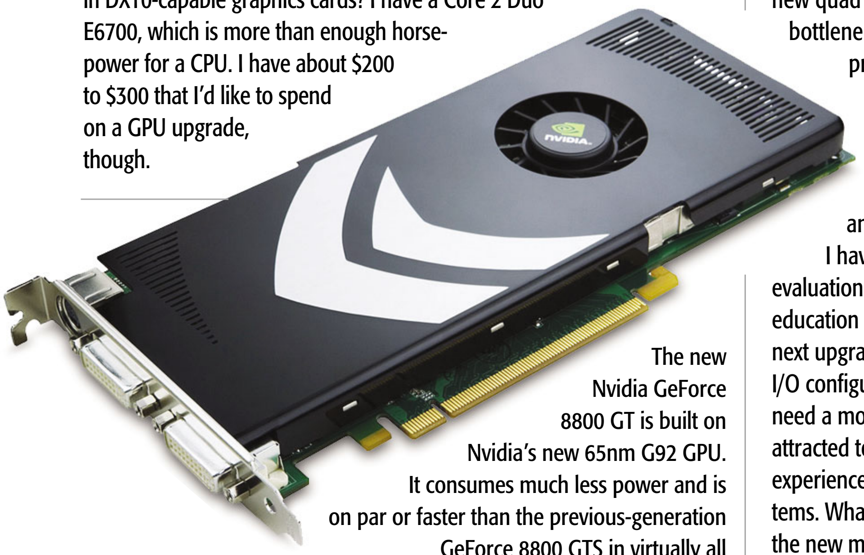
**Chris F. asked: I am saving up my pennies to build a new system and am debating between the 32- and 64-bit versions of Windows Vista Home Premium. I previously ran Windows XP Pro 64-bit but got frustrated with it due to lack of support for many drivers and applications, and I ended up reverting to 32-bit WinXP Pro. I mainly use my system to play games, so driver and application compatibility is a big deal to me. I am planning to pair a QX6850 with 4GB of RAM on an Asus Striker motherboard (like the HP Blackbird 002), but I know I will be losing available memory if I stick with the 32-bit edition of Vista. Is it worth the extra money to upgrade to the 64-bit edition? And are manufacturers providing full support for the 64-bit flavors of Vista, or are we back to the whole plug-and-pray functionality and near-total lack of support we had with WinXP Pro 64-bit?**

**A:** We completely understand where you’re coming from, Chris. We experimented with Windows XP Professional x64 Edition for quite a while after its release and dealt with the same issues that you did. The landscape has completely changed since the release of Windows Vista, however. We’re at a point now where almost all new computers being sold are 64-bit capable, and both Intel and AMD have had 64-bit-capable processors in their product lineups for a number of years. Talking strictly from a hardware standpoint, 64-bit desktop computing has arrived. We have also seen some issues with cutting-edge games not handling the 2GB address space limitation in 32-bit versions of Windows very well, so more and more developers are jumping on the 64-bit bandwagon.

To answer your questions specifically, yes, at this point in time, we feel it is worth the extra investment to get a 64-bit edition of Vista. Currently, there is only a $10 to $20 price difference depending on the reseller, which is money well spent. We’re sure this opinion is going to send some die-hard WinXP and Linux fans into a tizzy, but with a cutting-edge system such as the one Chris is designing that will be primarily used for gaming, it’s only a matter of time before support for DirectX 10 and large amounts of memory will be a must. Resistance is futile.

The answer to your second question is also “yes”. Just about every major manufacturer is supporting 64-bit flavors of Windows Vista at this point in time. There are a few caveats, though. Not all legacy hardware is supported by Windows Vista, so if you have an older printer or peripheral, there's a fairly good chance you won't be able to find drivers for it. In a move designed to increase the quality of drivers, 64-bit editions of Windows Vista also require drivers to be digitally signed by Microsoft before they can be installed, which has slowed driver development at some companies. With current hardware, however, you shouldn't run into many issues. We've run 64-bit editions of Windows Vista on a number of different platforms and have had good experiences with the vast majority of them. Just be sure to update your motherboard's BIOS and the firmware for your other components and grab the latest 64-bit Vista drivers for all of your hardware before you begin. We'd also recommend taking a look at "Modder's Guide To Windows Vista" in the Hard Hat Area of the August 2007 issue.

**Jimmy B. asked:** I'm interested in upgrading my graphics card to something new but want it to be reasonable for power consumption. I'm a pretty serious gamer, but I run at 1,280 x 1,024 resolution on a 19-inch LCD, so I don't need an insanely powerful setup. In the future, I might move to a widescreen format, but probably no more than something like a 20-inch LCD. I currently own a Radeon X1950 Pro 256MB card, and it has served me well for the most part, short of a few driver glitches here and there. What would you suggest I consider for the latest in DX10-capable graphics cards? I have a Core 2 Duo E6700, which is more than enough horsepower for a CPU. I have about $200 to $300 that I'd like to spend on a GPU upgrade, though.



The new Nvidia GeForce 8800 GT is built on Nvidia's new 65nm G92 GPU. It consumes much less power and is on par or faster than the previous-generation GeForce 8800 GTS in virtually all gaming situations.

**A:** Good question, Jim, especially since the competitive landscape has recently changed quite a bit in this area. While your Radeon X1950 Pro is a solid card, it definitely is getting a bit outdated now. We'd guess you have a dual-slot cooled variant of the card, as well? Regardless, there are significantly more powerful cards out there these days that are both single-slot designs and DX10-ready, not to mention much more power-efficient.

We'd suggest you take a hard look at Nvidia's new GeForce 8800 GT. For around $200 to $250, you get Nvidia's latest GPU architecture that is DX10-ready and faster than, almost across the board, Nvidia's previous-generation GeForce 8800 GTS. The GeForce 8800 GT GPU, known as Nvidia's G92, is built on a 65nm manufacturing process, as well, so it consumes less power, runs at a higher core clock speed of 600MHz, and is built with a single-slot cooler. This card will run circles around your Radeon X1950 Pro, and do so consuming about the same amount of power. We've benchmark-tested the card at Hot Hardware.com (www.hothardware.com/Articles/NVIDIA_GeForce_8800_GT__G92_Takes_Flight), and at 1,280 x 1,024 or 16:10 widescreen (1,280 x 800), this card will fly through any new game engine you throw at it with high detail and image quality settings.

**Farrald asked:** My plan is to upgrade my main desktop system soon. My present system uses an Asus P4P800 motherboard and an Intel P4 2.6GHz hyperthreaded CPU. No overclocking is being done. I run a RAID 0 array of two WD250 Caviar drives, controlled with a 3Ware Escalade Model 7000-2 Parallel ATA Raid Controller in one of the PCI slots. I also have 2GB of DDR2 memory running in dual-channel mode. My graphics card is an ATI All-In-Wonder X800. I run Windows XP Pro, and I do not plan to migrate this system to Vista anytime soon.

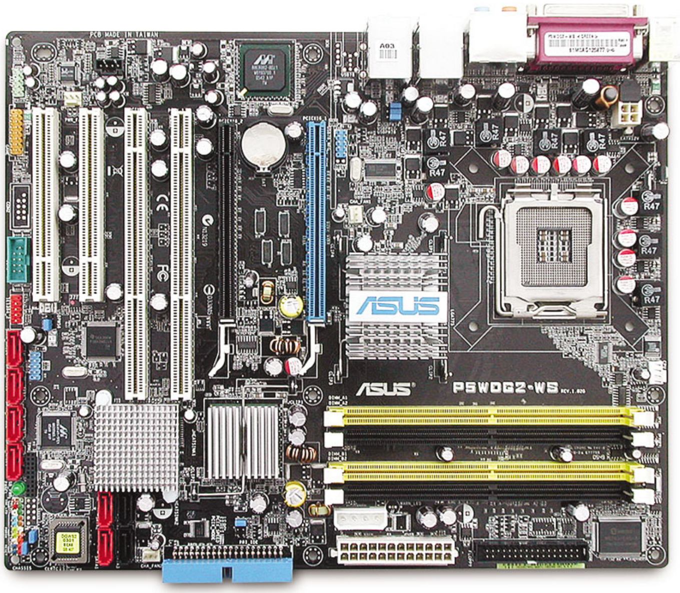
I want to upgrade to one of the latest Intel Core 2 Extreme QX6850 3GHz processors, because my main business processing software is being redeveloped for advanced multithreading to effectively use a new quad processor. Through studies, I have determined that the main bottleneck in my processing job is the speed of the FSB that I am presently using. I want to upgrade to the fastest FSB that I can and install the fastest DDR3 memory that I can. I want to get the very best chipset that I can, as well. My present graphics card seems to be adequate for the amount of graphics processing I need. I do not use this system for any game play.

I have just read the current issue of *CPU* with the motherboard evaluation article. This article was very informative and valuable to my education about all these new motherboards. I would like to make this next upgrade work without the cost of completely replacing my current I/O configuration because it is adequate for my main job. So, I think I need a motherboard that will accommodate my current PCI card. I am attracted to the Asus product line because I have had such bulletproof experience with my present system and with Asus mobos in my past systems. What would be the very best choice for me to make now, among the new motherboards that you have reviewed?

**A:** You have some very specific requirements here, Farrald, and the detail you gave helps a lot in making our recommendations. For starters, you're right on with respect to your interest in the new Core 2 Extreme QX6850. It currently is one of the fastest chips in Intel's lineup, save for perhaps the new Core 2 Extreme QX9650. The QX9650 has a total of 12MB of on-chip L2 cache (vs. 8MB on the QX6850) and is built on Intel's new 45nm manufacturing process for lower power consumption. The QX9650 will run you around $1,200, though, so keep a lookout for better pricing on the QX6850. Both chips run on a 1,333MHz FSB, so if bus speed is your limiting factor, either chip should perform well for you.

We're absolutely tickled by the new Asus P5KE3 Deluxe motherboard. This board is based on Intel's X38 Express chipset, runs DDR3 memory, and has a pair of Gen2 PCI-E slots for future PCI Express compatibility. It also has three standard PCI slots for your RAID controller and a bunch of integrated peripherals, such as dual Gigabit Ethernet ports and integrated 802.11g. This is one of our favorite boards currently on the market in terms of Intel-based solutions. And you're right, Asus has rock-solid stability most of the time; we rarely have to send its products back for replacement. Asus also does tend to run a premium price over similar motherboards, but with your sights set on the likes of the Core 2 Extreme QX6850, we'd hazard a guess that budget isn't as much of a concern for you on this upgrade.

**Karen K. asked:** **So, I call Intel because the Core 2 Duo processor I just bought doesn't work on the Asus P5WDG2 WS board I just pulled out of the box. They give me the brilliant answer of "Update the motherboard's BIOS." I just love tech support like that. Having worked in support for 10 years now, I know how stupid it is to give an answer like that and wash my hands of a pesky customer. OK, so what if I don't have another CPU to install into the board to update the BIOS? Is there a place that rents low-end CPUs for situations like mine? This has got to be the most ridiculous situation I've ever been in, technically speaking. I have lots of OLD parts lying around, but generally speaking, nothing new enough to work with either of these items. That was the whole reason for buying them. Can I send back an Intel chip covered in thermal paste and get my money back? Because I'm ready to GIVE UP!**



Some motherboards, such as the Asus P5WDG2-WS, didn't support Core 2 Duo processors until updated BIOS files were made available after the processor's launch.

**A:** If you're certain that the Core 2 Duo CPU you have there is not defective, your problem is that you called Intel for tech support. Asus is the company that should be helping you in this instance. What often happens is that a motherboard has been sitting on a shelf when new processors are released, and the BIOS installed on that motherboard doesn't support the new CPUs. If you can't get your hands on an older CPU to update the BIOS yourself, Asus will be able to send you a new BIOS EEPROM already programmed with the latest BIOS to replace the one that came installed on your mobo. This isn't the case with every motherboard, because some BIOS chips are soldered to the PCB, but on the P5WDG2-WS, the chip resides in a small socket and is easily replaced.

There are a few things to keep in mind, however. The P5 WDG2-WS is based on the 975X Express chipset, which does not support Intel's latest Core 2 Duo processors with 1,333MHz front side bus speeds. If you have a processor with a 1,333MHz FSB, you have to upgrade the motherboard to something based on the P35 or X38 chipsets or exchange the CPU to something with a 1,066MHz FSB. Also, try setting up the computer with only the bare essentials installed: CPU, RAM, and video card. And try moving your memory to different DIMM slots. On the P5WDG2-WS, you should be using a matched pair of DIMMs in like-colored DIMM slots for dual-channel operation. ▲

**by Dave Altavilla and Marco Chiappetta, the experts over at HotHardware.com**

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- EVGA Motherboard
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# Idemix: Keeping Your Personal Information To Yourself

Imagine that the next time you stop at the gas station to fill your tank and buy a candy bar, the clerk asks you to fill out a form with a lot of personal information, such as credit card information, mailing address, and a driver's license number. As you attempt to hand the clerk a $50 bill, you probably would think the clerk was crazy, and you'd refuse to share the information.

Yet, when making a purchase on the Internet, you often enter a large amount of information into an online form, some of which is pertinent to the transaction . . . and some information that isn't pertinent.

To be fair, most Web site forms give you the option of not submitting certain nonessential information. But, if given the option of only sharing the minimum amount of information required to complete the transaction, most people would select that option. Even better would be the ability to be completely anonymous when performing Web transactions.

IBM's researchers might have the solution. The IBM product, called Identity Mixer (Idemix for short), would make use of digital information "tokens" to share only the required information with a Web site during a transaction. The tokens would simply verify your identity and submit only the minimum amount of information for the transaction.

"Identity Mixer works like an electronic version of a conventional wallet that holds your driver's license, credit cards, identity cards, health club membership cards, etc.," says Anthony Nadalin, IBM's Distinguished Engineer and chief security architect for Tivoli software.

## Idemix In Action

Idemix will work in a variety of situations. For example:

- When making an online purchase, a clearing house must verify the credit card number and perform the actual

## Putting Idemix To Use

With Identity Mixer, the user stores his personal information on his own laptop, mobile phone, or other device. An electronic card, also called a token, contains each piece of data, whether it's a birth date, credit card number, or mailing address. An issuing authority, also called an identity provider, would verify the data in the token.

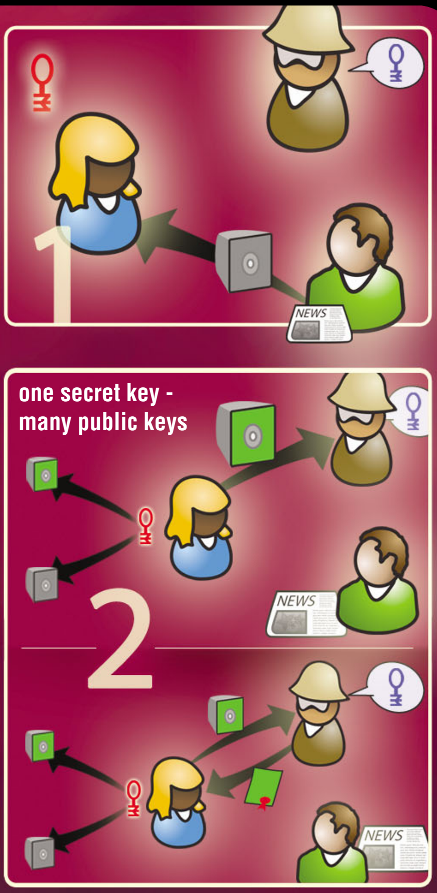
"Identity Mixer uses the electronic cards as a proof to the site that the user indeed has the authorization to access," IBM's Nadalin says. "Identity Mixer allows the user to perform this without revealing any other information about herself."

Here's an example of how Idemix could work. Let's say a user wants to access some premium information on a newspaper Web site. The user already has an account at the site, but the user wants to use the site anonymously. On the flip side, the newspaper needs to make sure that (at the least) the user is verified as a paying customer, otherwise anyone could access the site's premium content.

1 After the user (red key) registers with the newspaper site and pays for premium service, the newspaper provides an Idemix token (gray icon).

2 The newspaper's Idemix token is stored by the user along with her other personal information tokens (light green icon). As part of Idemix technology, the user's Idemix software (blue key) transforms the user's tokens into any one-time, generic tokens that are needed—in this case, a generic token for the newspaper's Web site (light green icon with red ribbon) that contains only the information needed to verify that the user has access to premium content. Only those who have properly obtained a token from the newspaper could use Idemix to create a one-time token for the newspaper's site. In cryptography terms, you can think of the specific token as the "one secret key," or the private key, and the one-time token as the public key. There is only one private key, and there are multiple public keys.

"Note that the user can generate as many one-time tokens


1
NEWS
one secret key - many public keys
2
NEWS
NEWS

Source: IBM

transaction. Rather than giving both the merchant and the clearing house the customer's credit card number, Idemix would ensure only the clearing house has the number; the merchant would simply receive verification.

- If you want to rent a vehicle online, you wouldn't need to give the company your actual driver's license number to prove your age. Instead, the digital token would simply verify that you are old enough to meet the company's criteria with age; the token would not provide your actual driver's license number or birth date.
- If you change your mailing address, you could use Idemix to make the change once. Every entity that needs your new mailing address would then receive information about the change.
- When receiving a product from an online retailer, many retailers use a third-party shipping service. With Idemix, you wouldn't have to share your mailing address with the online retailer, only with the third-party shipper.
- If you use the same password at a few different Web sites, you could change that password just once using Idemix and choose to have the password shared with the appropriate Web sites.

### Microsoft CardSpace

CardSpace from Microsoft is built into Vista, and it provides technology similar to Idemix, allowing users to protect as much of their personal data as possible.

One difference: Rather than storing the digital tokens yourself (as occurs with Idemix), CardSpace must digitally contact the entity that holds the piece of identity information you need. It then will pass that information on to complete your transaction. Idemix is also an open-source piece of software; Microsoft owns and controls CardSpace.

For more information about CardSpace, visit www.microsoft.com/net/cardspace.aspx on the Web. ▲

### Higgins Project

Idemix has evolved out of the Higgins Project, on which IBM, Novell, the Berkman Center for Internet & Society at Harvard Law School, and Parity Communications collaborated, beginning early in 2006. The Higgins Project's focus is to create an open-source software package that would allow people to authenticate their identities when they're online without the need to share a lot of extra information. Those involved in the Higgins Project want to give Internet users more control over their information.

"In the past year, we've seen a growing interest in Identity Mixer as privacy becomes a major concern across the globe," Nadalin says. "In particular, with the government, financial, and telecommunications sectors, we are seeing a lot of interest and potential for this technology."

Nadalin says Web merchants, who usually collect a variety of information on their customers, haven't yet registered any worries about Idemix.

"So far, no one has balked at the idea, but, as usual, they all insist that this must become easy to use for the consumer," he says.

Work continues on the Higgins Project and on Idemix. Nadalin says pilot versions of Idemix could appear in the next couple of years, with final versions possible in the next two to four years. Until then, users will be on their own when it comes to guarding their information. As always, common sense should rule your decisions: If you don't feel comfortable sharing certain personal information with a certain Web site, trust your instincts and keep that information to yourself. ▲

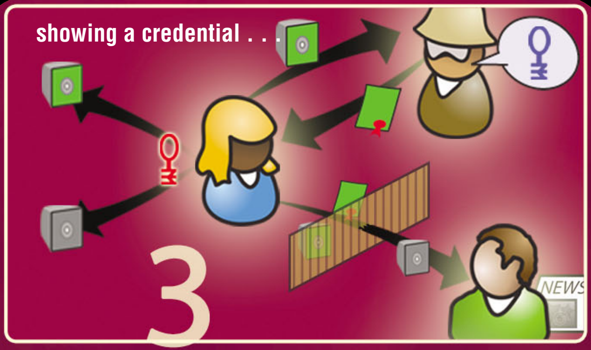
**by Kyle Schurman**

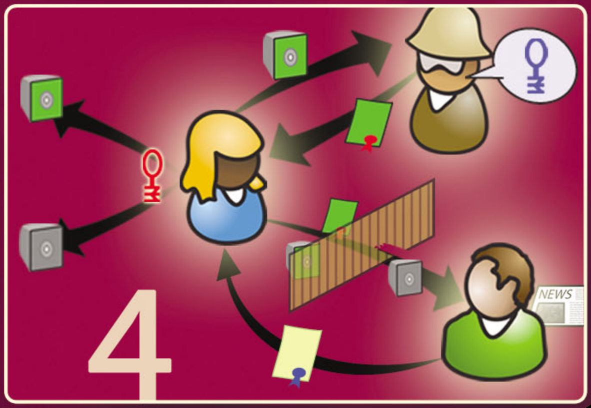
as she wishes from her original Identity Mixer credentials, and that all these tokens are indistinguishable from each other, if they are generated by the same or different users," Nadalin says.

3 The new generic token still carries the information that verifies this user as having access to premium content, but because the token is generic, it doesn't identify the user specifically. As you can see from this graphic, you can think of Idemix as providing a barrier between the user and the newspaper's site, showing the Web site only the one-time, generic token. To the newspaper's Web site, this user looks the same as every other user who has premium site access.

4 With the generic token verified, the site provides the premium content to the user.

"The user would benefit from Identity Mixer in this case since she can make her queries anonymously," Nadalin says. "The service provider benefits from Identity Mixer as it will be able to provide a better service—or, in some very sensitive areas, such as health care, able to provide a service it otherwise couldn't. Also, the less personal information a service provider obtains, the easier it is for the service provider to protect that information, such as from malicious access by third parties." ▲





# Technology Super Bowl

## Football Concussions vs. Simbex's HIT System

Sports and technology have kind of enjoyed a love/hate relationship. The Web brings fans a wealth of information, but, let's face it, fantasy football Web sites haven't exactly been good for the production levels of American workers. Although it's important to ensure a correct referee's call, replay reviews can really sap the energy from the stadium at an average NFL or college football game. Baseball purists will argue forever about whether advanced technology and equipment has improved or hindered the game. (Then again, baseball purists can argue about the designated hitter forever, too.)

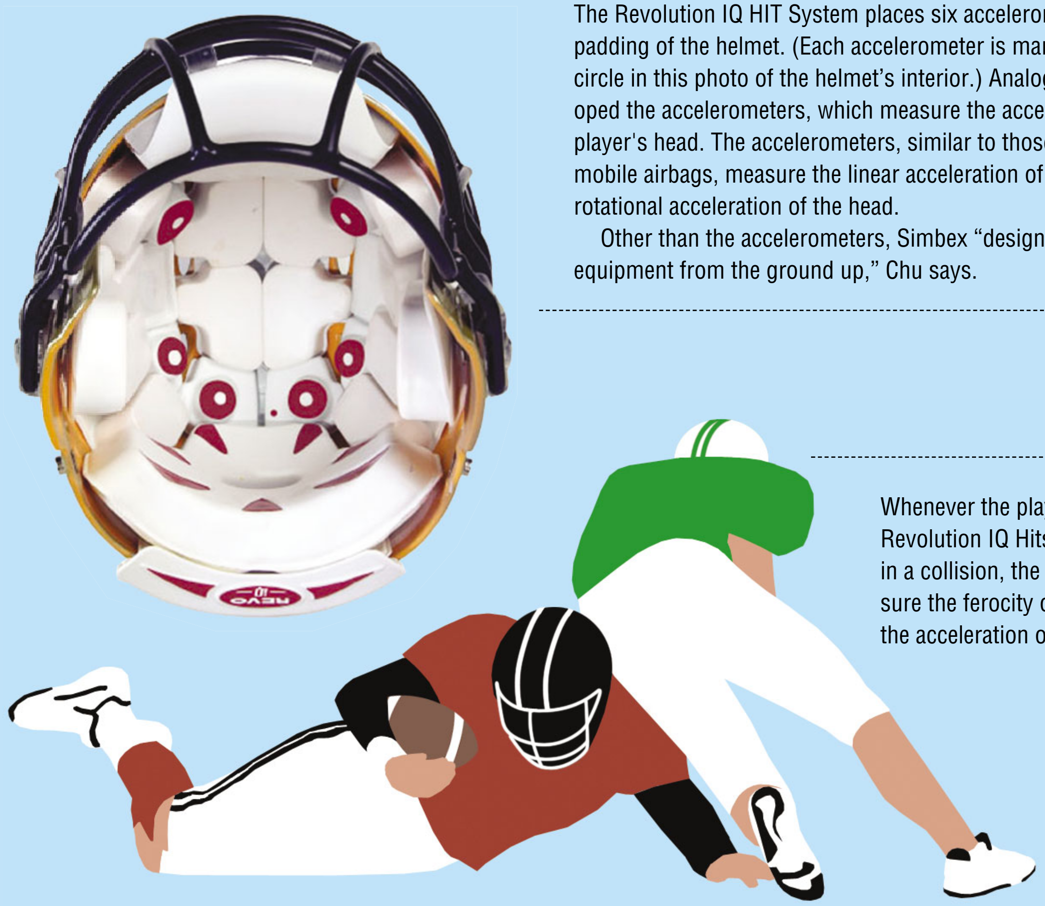
For the most part, though, technology has benefited sports, especially in medical improvements that allow players to recover faster from serious injuries. Now, thanks to technological advances from Simbex and its parent company, football helmet manufacturer Riddell, trainers and doctors will have far more immediate information for treating one type of especially dangerous football injury—concussions.

The Riddell helmets and the Simbex technology, all part of the HIT (Head Impact Telemetry) System, use components built into a football helmet to measure the ferocity associated with a collision in a game or a practice. Such measurements can give trainers and medical personnel insight into whether a collision was violent enough to cause a concussion risk.

### Concussion Side Effects

A concussion occurs because of a blow to the head, which causes the brain to strike the inner wall of the skull. Sports concussions certainly aren't limited to

### How It Works



The Revolution IQ HIT System places six accelerometers inside the padding of the helmet. (Each accelerometer is marked with a red circle in this photo of the helmet's interior.) Analog Devices developed the accelerometers, which measure the acceleration of the player's head. The accelerometers, similar to those found in automobile airbags, measure the linear acceleration of the head and the rotational acceleration of the head.

Other than the accelerometers, Simbex "designed all of the equipment from the ground up," Chu says.

Whenever the player wearing the Revolution IQ Hits helmet is involved in a collision, the accelerometers measure the ferocity of the hit, registering the acceleration of the sensors.

*Sources: Simbex, Riddell*

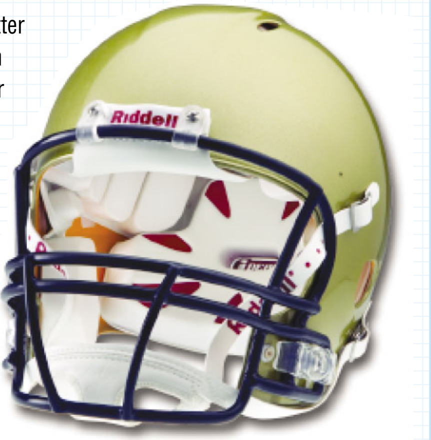
football. The Center for Disease Control and Prevention estimates about 300,000 sports-related concussions take place every year. But, because of the large number of collisions that occur in practices and games, concussions probably occur more frequently in football than any other sport. Football players wear helmets to help protect the skull. Padding inside the helmet can help absorb some of the energy from a blow. But helmets cannot completely protect the brain from concussions.

Concussions are among the toughest injuries for doctors and trainers to diagnose during a football game. Concussions don't always reveal themselves with easy-to-use sideline tests, and concussions sometimes don't provide any visual clues, unlike an injured knee or a cut. Some immediate symptoms of concussions, such as confusion, temporary memory loss, nausea, and ringing in the ears,

## Selling The Helmets

Riddell is commercializing the Simbex system with its Revolution IQ HIT System. Simbex developed the technology behind the Revolution IQ Hits, and Riddell (a sporting equipment manufacturer) purchased Simbex in 2004. Riddell now sells sensor-equipped helmets to individuals, along with the data collection tools. The Revolution IQ Hits helmets cost around $1,000 each.

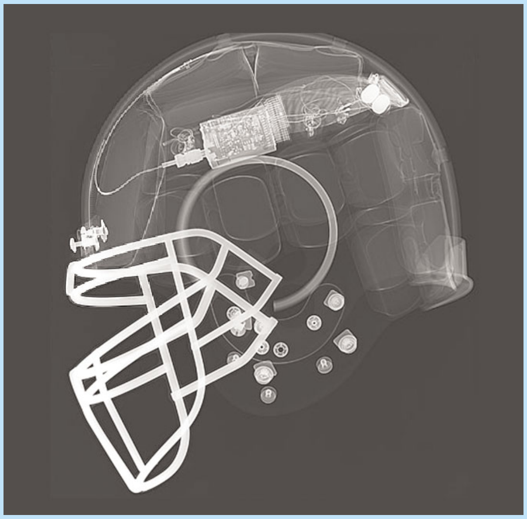
For the individual-based system, a transmitter built into the helmet sends data collected from collisions wirelessly to a laptop computer after the game or practice. (The reception antenna connected to your computer costs another $300, although not every computer will need one.) The software calculates the reaction force based on the data, and it alerts parents and medical personnel to any impacts that were fierce enough to potentially cause a concussion that would require additional medical attention. (Unlike the team system, the individual system does not collect data in real time during games.) ▲



Helmets used with the HIT System also contain a transmitter and a rechargeable nickel-metal hydride battery system, as you can see in this x-ray of the helmet. The HIT System's transmitters send data to a collection system on the sidelines for immediate feedback.

All of the electrical equipment seen in this x-ray weighs about 6 ounces, and it resides in empty spaces in the helmet, so the players don't notice or feel the equipment. Simbex, which developed the equipment, has never had any equipment fail because of an impact, Chu says.

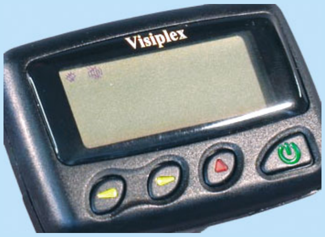
"The equipment is very robust," he says.



With the team-based system from Simbex, the transmitter in the helmet sends the data to a sideline response system for immediate analysis. The sideline response system includes a receiver (far left) and a laptop computer.

If the calculated reaction force exceeds the threshold for the player that the medical staff set before the game, the system will alert the medical staff through a wireless pager. The staff then can check the player's symptoms, attempting to determine if the player has suffered a concussion. It's important to note that every person is different, and the reaction force that causes a concussion in one player might not cause any injury in another player. The system simply alerts the medical staff to the possibility of a concussion; staff personnel then must administer additional tests to the player to determine whether an injury occurred.

"It just provides another set of 'eyes' on the field," Simbex's Chu says. "It tells them something has happened."



don't show up in every person who has a concussion. The symptoms of a concussion don't always appear immediately, either; sometimes players can hide the symptoms and return to the game, potentially causing additional injury (called second impact syndrome).

Research into both the short-term and long-term effects of concussions has grown recently. Former NFL players who are known to have suffered multiple concussions during their playing days are developing a variety of health problems several years later. Doctors and researchers often find these later health problems—such as memory loss, fatigue, irritability, depression, and headaches—seem to be a direct result of the concussions. Another problem with concussions: They have a cumulative effect, meaning once a player has had one concussion, the player becomes more susceptible to additional concussions later in life. Multiple concussions shortened the careers of two high-profile NFL quarterbacks, Steve Young and Troy Aikman, among hundreds of other players.

Fortunately for players such as Young and Aikman, their long-term problems so far have been few. Other players weren't so lucky. Former Pittsburgh running back Merril Hoge suffered two concussions within a few weeks in 1994; after the second concussion, he stopped breathing in the locker room. He retired soon after, but he had to learn to read again and suffered from serious symptoms for two years after his retirement. Hoge, who now works for ESPN as an NFL analyst, still has headaches related to the concussions. Some former NFL players, such as Mike Webster, have died in their 40s and 50s with problems doctors later traced back to concussions.

## Beyond Football

As part of a $932,000 contract, the U.S. Army recently ordered 20 combat helmets from Simbex with sensors to help them determine the effects of bomb blasts on soldiers. The combat helmets will contain the HIT System technology.

U.S. Army officials are interested in finding methods to measure head trauma in soldiers as they fight. Because head trauma isn't visible, soldiers sometimes might return to battle despite a serious brain injury.

Simbex also is researching methods for using the HIT System in ski helmets and in hockey helmets. Men's and women's hockey teams at Brown and Dartmouth plan to eventually wear the helmets and participate in the NIH study that Simbex is performing. ▲

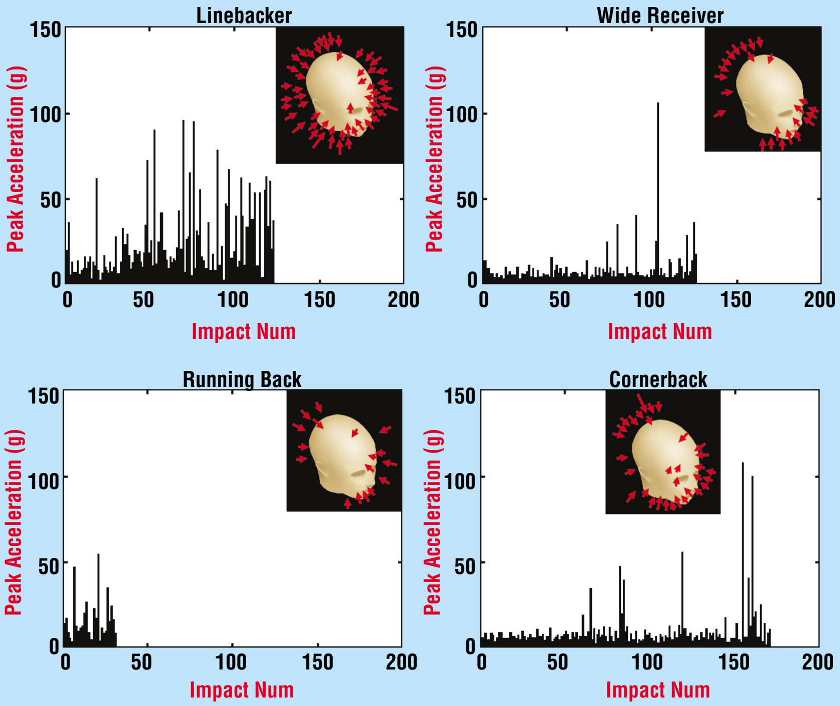
After a game or practice, the medical staff can plug the computer into an Internet connection, and the system will upload the data to Simbex. The company interprets all of the data, determining which players might be more susceptible to potential concussions. Simbex uses the data collected from all teams to further its research into concussions.

The system provides reports to the team, showing the number of hits each player suffered. After compiling the data, the software measures the hits in gravitational force (g). As you can see from these screenshots, the medical personnel can choose from several methods for viewing the calculations.

In the screenshot on the left, the software is comparing the impacts for players at four different positions (linebacker, wide receiver, running back, and cornerback). The data displayed includes the number of hits that the system registered, the peak acceleration of each hit, and the location of the hits.

In the screenshot on the right, the software focuses on one player, marking the location and time of each impact. The software also displays the peak acceleration of each hit (red graph). You can use the control boxes on the left side of the software window to change the parameters of the displayed data.

As part of Simbex's overall research study, the company is taking all of the data from all of the teams using the systems. It then uses the data to attempt to better understand concussions and the causes of concussions.



Medical personnel involved with caring for football players and league officials at all levels of football are taking concussions far more seriously now than they did 10, 20, or 30 years ago. Rule changes enacted in recent years attempt to protect defenseless players from brain-jarring hits. Extremely dangerous helmet-to-helmet hits draw large fines in the NFL and penalties in college and high school games.

The NFL has held what it calls "concussion summits" in recent years to address the issue. (Jeffrey Chu, vice president of engineering at Simbex, says his company doesn't yet work with any NFL teams, but they are discussing implementing the HIT System with a few teams.) The NFL has begun testing players before the season to determine a neurological baseline. Players who suffer concussions in the season then undergo additional neurological tests to determine what damage, if any, occurred versus the neurological baseline.

## Learning About Concussions

Because of the difficulty of diagnosing concussions, especially in the middle of a football game, and because of the growing knowledge of the damage concussions can cause in the long term, medical personnel are turning to technology for assistance. Simbex, a research and product-development company in New Hampshire, is providing that technology with its sensor-equipped helmets and HIT System.

"There is a very poor understanding of the biomechanical factors that contribute to mild traumatic brain injury, or concussions, in sports," Chu says. "It's a huge problem."

Chu says Simbex's president, Richard Greenwald, initially considered the idea of using sensors in freestyle skiing helmets about 15 years ago to measure head impacts that could cause concussions. However, the technology needed didn't exist.

"By 2000, he was sensing that the technology was becoming cheap enough and small enough to do these types of data collection," Chu says.

Simbex used a grant from the NIH (National Institutes of Health) to begin researching concussions and the biomechanical causes of them. Simbex is working with college football teams at Virginia Tech, Brown, and Dartmouth on the study. (A few other college and high school teams also are making use of the HIT System.) Simbex and the NIH hope that the research will help them determine whether certain types of impacts are more likely to cause concussions.

The research remains in its early stages, and it's too early to know exactly what types of hits cause concussions more often. Eventually, Chu says, Simbex hopes its data collected about concussions will help the company determine the best ways to prevent concussions in the future. The research might lead to rule changes or equipment changes that can limit concussions.

## Researching Concussions

With more and more sensor-equipped helmets in use, Simbex has more and more data available for its research. Chu estimates that 500 to 600 players wore the helmets last season, and the company received data on about 350,000 impacts during games and practices.

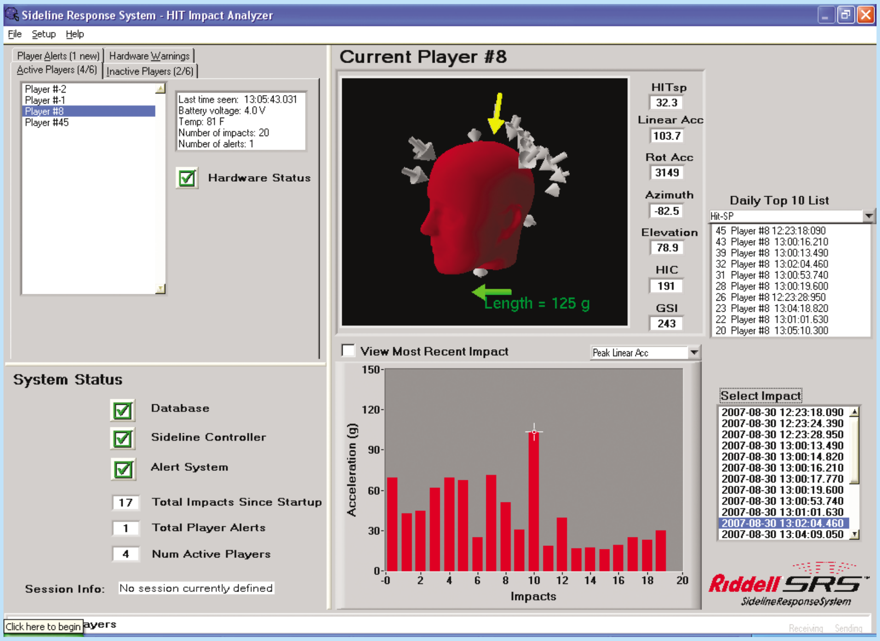
"We're starting to make some headway," he says. "We're trying to understand head injuries, which is a difficult task."

As part of the data research, Chu says Simbex can provide the schools' medical personnel with a variety of scenarios where concussions may occur. For example, thanks to the time stamp on each impact, the data might show that a certain practice drill yields impacts that could lead to concussions. Or the data might show that one player is receiving more dangerous impacts than his teammates during a certain drill, which might reveal poor tackling or blocking techniques.

"The system is not just providing a safety benefit; it has a performance benefit, too," Chu says.

Although the performance benefits to the HIT System are handy, they probably aren't going to put any coaches out of work just yet. It's the potential safety benefits and the value of the research that make Simbex's system truly a big-time hit. If the research eventually leads to an improved method for preventing concussions, the HIT System will be worthy of the top spot on the Top 10 Sports Center highlight list. ▲

**by Kyle Schurman**


Sideline Response System - HIT Impact Analyzer

Player Alerts (1 new)
Hardware Warnings
Active Players (4/6)
Inactive Players (2/6)

Player #-2
Player #-1
Player #8
Player #45

Last time seen: 13:05:43.031
Battery voltage: 4.0 V
Temp: 81 F
Number of impacts: 20
Number of alerts: 1

☑ Hardware Status

System Status

☑ Database
☑ Sideline Controller
☑ Alert System
17 Total Impacts Since Startup
1 Total Player Alerts
4 Num Active Players

Session Info: No session currently defined

Current Player #8

HITsp: 32.3
Linear Acc: 103.7
Rot Acc: 3149
Azimuth: -82.5
Elevation: 78.9
HIC: 191
GSI: 243

Daily Top 10 List: Hit-SP

45 Player #8 12:23:18:090
43 Player #8 13:00:16.210
39 Player #8 13:00:13.490
32 Player #8 13:02:04.460
31 Player #8 13:00:53.740
28 Player #8 13:00:19.600
26 Player #8 12:23:28:950
23 Player #8 13:04:18.820
22 Player #8 13:01:01.630
20 Player #8 13:05:10.300

☐ View Most Recent Impact — Peak Linear Acc

Select Impact

2007-08-30 12:23:18.090
2007-08-30 12:23:24.390
2007-08-30 12:23:28.950
2007-08-30 13:00:13.490
2007-08-30 13:00:14.820
2007-08-30 13:00:16.210
2007-08-30 13:00:17.770
2007-08-30 13:00:19.600
2007-08-30 13:00:53.740
2007-08-30 13:01:01.630
2007-08-30 13:02:04.460
2007-08-30 13:04:09.050

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# THE GREAT (CPU) DEBATE

## Penryn & Phenom Make Their Pitches

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### Multicore Slugfest

A Challenger Rises, But Can It Unseat The Incumbent?

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### DDR3 Dash

Five Bandwidth-Busting Kits Strut Their Stuff

If you're new to the high-end computing scene, you might not know that Intel's reign atop the CPU food chain hasn't been uninterrupted. Sure, Intel's Conroe architecture has beat AMD's competitive offerings up and down the street for well over a year, forcing the latter company to hawk its processors at drastically reduced prices.

But a few years ago, AMD was top dog. Nothing out of Santa Clara could touch AMD's line of Athlon 64 FX processors, which started when the FX-51 hit the scene in September 2003. (AMD's line of regular Athlon 64 processors was also impressive.) During that span of almost three years, serious gamers and many other power users treated Intel's processors like a country fried steak from Sizzler: serviceable in a pinch but a far cry from a Ruth's Chris filet that true connoisseurs prefer. Intel still dominated the OEM market, but DIY system builders knew better. As Intel's Pentium 4 clock speeds and temperatures spiraled through the roof (remember Prescott?), AMD's Athlon 64 FXes held a steady lead.

Then, Intel's Israeli team cooked up Conroe, and the rest is history.

Of course, AMD wasn't exactly resting on its laurels when Intel shifted into the passing lane and tromped on the gas. Its FX-60 processor was the first dual-core Athlon 64 FX, and the company's 4x4 platform gave AMD-powered rigs quad-core flavor (albeit via two CPU sockets for two dual-core processors). Still, Conroe-based chips were architecturally better, and advantages AMD had long enjoyed (such as an integrated memory controller) suddenly didn't seem to matter as much.

Over the past year especially, AMD has been dogged by late product arrivals, financial woes, and the lack of identifiable ultra-high-end components. For example, AMD introduced the long-awaited Radeon HD 2900 XT as the "price/performance leader," essentially ceding the pinnacle of performance to Nvidia. Its processor lines tell a similar story: AMD CPUs are reliable and perform well for the money, but for the PC enthusiast who has to have the very best, AMD's options left a lot to be desired.

Now, as both chipmakers release new architectures, phrases such as "the stakes couldn't be higher" suddenly become more believable than melodramatic—if you're AMD, at any rate. Intel's Penryn architecture makes marked improvements to Conroe, including a new high-k metal gate technology, which revolutionizes transistor production and breathes new life into Moore's Law. Penryn chips also boast a new instruction set, among other enhancements. Find out more about the next evolution in Core 2 computing on page 62.

For AMD, its Phenom desktop processors and their underlying K10 Barcelona architecture mark an end to the FX era. With Phenom, AMD moves to a 65nm process and a native quad-core die. (Intel's quad-core chips utilize two dual-core dies grafted onto a single platform.) Phenom processors also feature a different set of SSE4 instructions that aren't present in Penryn. And close to Phenom's launch, AMD added a new wrinkle by announcing tri-core Phenoms. It's an interesting move in an industry dominated by even numbers; two years ago, we'd call the announcement genius, but with AMD struggling to rediscover its Midas touch, time (and sales) will tell. For a closer look at K10, turn to page 58.

Of course, white papers will only tell you so much. That's why we've assembled two dream machines, each with Intel's and AMD's respective gladiators, and thrown them together for a—insert ultimate fighting/boxing/pro wrestling cliché here—on page 66. For Intel, it's an opportunity to reassert its Core 2 architecture's supremacy. For AMD, well, let's just say AMD's long on creditors and short on mulligans.

We've brought you the best DDR2 kits on the market; and now, we have done the same for DDR3 with the latest batch kits. The roundup on page 70 covers five kits from four manufacturers. But more importantly, it shows that some of the early growing pains DDR3 faced (high clocks at the expense of high latencies and prices) are starting to abate.

With these processors set to go toe-to-toe, the *real* Decision '08 could end up being which CPU will be your next upgrade. ▲

**by Vince Cogley**

# PHENOM EXPLAINED

## AMD Tries To Reclaim The High End

To say that it has been a rough transitional period for AMD would be quite an understatement. After its mid-2006 blockbuster purchase of graphics workhorse ATI, AMD has faced its share of battles, both on the production and financial sides of its business. The company has had to contend with several delays of its next-generation architecture and has failed to do much of anything with its existing Athlon 64 lineup (besides a clock speed increase here and an unlocked multiplier there) to compete against Intel's Core 2 processors. Although AMD's latest processor releases have no doubt been good, they simply haven't been *as* good as Intel's.

Without any new processor architecture to defend against Intel's Core 2 assault, AMD has been forced to slash prices on its current lineup in order to stay competitive. This has been excellent for consumers, providing budget and midrange buyers the opportunity to purchase some great low-cost dual-core processors, but it's put the hurt on AMD's financials. As of this writing, AMD's top-of-the-line Athlon 64 X2 processor can be had for roughly $200, a far cry from the $1,000 top-tier Athlon 64 FX processor releases we saw in 2006. Although the present is somewhat dark for AMD, there is a beam of light shining through the clouds.

The K8 architecture is yesterday. AMD's future lies with a bold new architecture, which has been developed under the codename K10 (later Barcelona). K10 has reportedly been in the design phase since early 2005 and likely was started on when (or possibly before) processors based on the K8 architecture started shipping. K10, introduced to the desktop market under the moniker "Phenom," represents some bold steps forward for AMD and is designed to keep pace with Intel; AMD obviously hopes K10 will even supplant Intel's Core 2 as the premiere architecture. A noble goal to be sure, although in order for it to be a success, AMD not only has to execute flawlessly on the design side but also manufacturing, as well, which has typically been its Achilles' heel. On the surface, AMD appears extremely confident in Phenom's abilities and how it will outpace Intel's offerings with ease. But prior to launch, AMD has been very tight-lipped with information about K10, which has led to a lot of incorrect information being passed off as fact.

### 65nm From The Get-Go

What we do know is that AMD's Phenom architecture is largely based on the K8 architecture of the past but has some unique attributes that truly set it apart. Phenom will be AMD's first processor core which is designed from the ground up on 65nm manufacturing technology and will likely scale to a 45nm process within the 2008-2009 timeframe. With the refined 65nm process, AMD should be able to produce K10-based processors at reasonably high clock speeds with aggressive power consumption levels in comparison to previous-generation 90nm designs. If there's a bright side to the production delays, it's that they will hopefully let the company iron out the kinks in order to ensure Phenom chips roll out with minimal problems.

### Quad-Core Goes Native

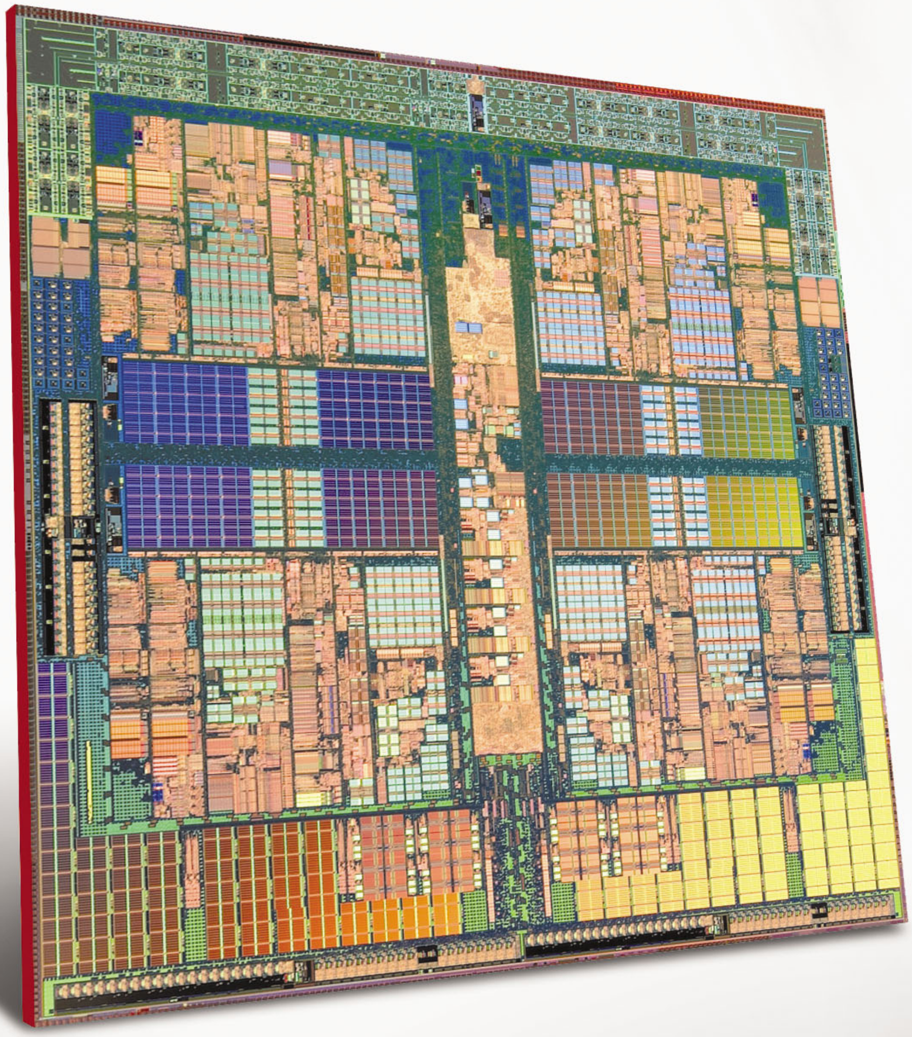
The architecture of the K10 lets AMD scale the number of processor cores easily. Arguably the architecture's best design aspect is its native quad-core processor design, a first for processors. AMD claims that having a native quad-core design with all four cores being manufactured on the same processor die is the most efficient route to go in terms of latency, heat output, and overall performance. In comparison, Intel manufactures its quad-core processors by utilizing two dual-core processor dies on a single processor socket. Intel's method let it bring quad-core processors to the market faster; over time, Intel has been able to spread quad-core offerings across multiple price levels, giving midrange buyers access to four cores. Is AMD right, though? Does stuffing all four cores on one die really make a difference? Turn to "Multicore Slugfest" on page 66 for a blow-by-blow account of quad-core vs. quad-core.

## Die Size & Cache Design

Combining AMD's integrated memory controller with four processor cores on a single die at 65nm means that AMD's quad-core Phenom processors will be fairly large in terms of overall die size, which adds additional questions in terms of how quickly AMD can manufacture these processor cores.

On the flip side, AMD's Phenom processors will have significantly less cache per die in comparison to Intel's latest generation of processors, which will help bring overall die size down. (L2 cache is typically the largest space hog within a processor design.) Early estimates have pegged a quad-core K10's die size at about 300mm$^2$, which, if correct, would make Phenom's die size almost 33% larger in comparison to Penryn's 214mm$^2$ die, which Intel manufactures on a 45nm process.

AMD is pushing forward with a unique cache layout with its Phenom lineup. The L1 cache allocation appears to be identical to K8 processor designs, with 64KB for instructions and 64KB for data. L2 cache in K10 processor designs will be 512KB per core with 16-way associativity; this may seem small in



The die shot of AMD's quad-core Barcelona processor design shows us a great deal of what to expect on Phenom's die.

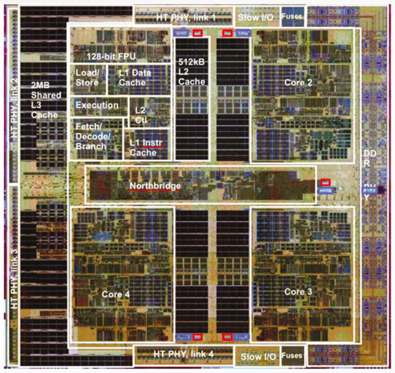
*Photo courtesy of AMD*

comparison to the large L2 caches of Intel's Core 2 lineup, but AMD has improved its L2 cache design by improving bandwidth to the cache—a 128-bit connection compared to previous generation's 64-bit.

Instead of opting for a large amount of L2 cache per core, AMD chose to go with a fairly small, efficient amount of L2 cache along with a larger 2MB of L3 cache. This brings total cache (L2+L3) up to 4MB for its quad-core components. (L1 cache is typically not counted.) In comparison, Intel's next-generation quad-core components will have three times as much—a total of 12MB of L2 cache. (Core 2 processors don't include an L3 cache.) With this kind of cache discrepancy, AMD is pushing the efficiency of its processor cores.

AMD's integrated memory controller technology has been updated this go-around, as well, and is still a major selling point for its processor lineup. Having an integrated memory controller paired alongside four cores and a large chunk of cache means that latencies are extremely low throughout the entire processor, controller, and memory areas; this helps performance across the board. For the K8, AMD used a dual-channel DDR2-800 memory controller. Phenom products will feature a similar dual-channel memory controller, but the integrated memory controller is certified for memory speeds up to DDR2-1066. This helps latencies and will improve peak memory bandwidth from 12.8GBps to 17GBps. Although using DDR2-1066 memory doesn't sound as impressive as Intel's platforms using DDR3-1600 (and up), DDR2 memory is still quite a bit less expensive than DDR3. And like prior generations of DDR, DDR3 still doesn't offer the same return on investment as DDR2. This could help AMD from an overall system cost perspective, shaving $100 to $200 off a fully loaded system. AMD is currently planning to make the transition to DDR3 in 2009 with the introduction of its Socket AM3 platform.

AMD's K10 architecture also showcases improvements in prefetching (double-sized branch prediction compared to K8), multimedia applications (128-bit SSE units along with a subset of SSE4 with specialized instructions that Intel is not using), memory capacity (48-bit memory addressing, up to 256TB), and system interconnect speed and bandwidth (scalable speed HyperTransport 3.0).



Phenom's cores are spread out equally throughout the die; the memory controller and L2 cache sit in the middle.

*Photo courtesy of AMD*

## Power Management Changes Aplenty

Some of the most unique aspects of Phenom's architecture lie in AMD's new power management features. AMD is showcasing a series of new technologies in Phenom, dubbed Enhanced PowerNow!, Independent Dynamic Core, Dual Dynamic Power Management, and CoolCore. AMD's K10-based processors are able to detect processing load levels on the fly and raise and reduce clock speeds as performance is needed. When processing loads are low, the processor can clock down certain cores that aren't busy, not only in terms of clock speed but voltage levels, as well. Entire cores can be disabled and re-enabled as processing loads vary. Intel's chips can't adjust their cores on an individual basis.

In addition, the processor's cache, HyperTransport clocks, and voltage levels can also vary depending on loads. In terms of power management, AMD has excelled beyond Intel with the K10 architecture. Early numbers from Anandtech showed AMD's K10-based Barcelona Opterons are much more power efficient per clock in comparison to Intel's Xeon processors; this bodes well for AMD's Phenom lineup when it competes against Intel's upcoming 45nm Penryn-based Core 2 products.

In order to showcase Phenom's lower power requirements, AMD has introduced its own power rating methodology system, dubbed ACP (Average CPU Power). AMD wants to measure processor power consumption by averaging power load under a series of processor-intensive benchmarks, along with factoring in the processor's memory controller and power management features. Not surprisingly, AMD has shown that its Opteron processors consume 25% less power using the ACP methodology than using TDP. Although we're all for more accurate testing of power levels, it's unlikely that this methodology will become the industry standard without Intel's support; at the current time, we don't see this happening. In any case, AMD will likely produce both ACP and TDP numbers for its upcoming K10-based processors.

## The New Fleet

AMD will be shipping K10-based cores in a myriad of product lineups. You've likely already heard of Barcelona (AMD's codename for its quad-core K10 for workstation/server processors sold under the Opteron name) and Agena (AMD's quad-core K10 for desktops, to be sold under the Phenom name). Kuma, Lima, and Sparta are other K10-derivative codenames being thrown around for Barcelona-based Athlon X2, Athlon LE, and Sempron processors, respectively.

AMD is currently shipping K10-based Opteron processors as "third-generation Opterons," or the Opteron 2300 series. These quad-core processors are shipping at clock speeds ranging from 1.7 to 2GHz; clock speeds up to 2.5GHz are expected by the end of 2008. Prices, thus far, have been fairly conservative, as AMD tries to ramp up clock speeds to make the chip more competitive. Top-of-the-line 2P Barcelona-based Opterons are selling for south of $500, far lower than last-generation Opterons, which debuted at prices between $900 and $1,200. For comparative purposes, Intel's top-of-the-line 2.93GHz Xeon X7350 currently sells for $2,500 and up. In the past, Intel and AMD's high-end products would typically be comparably priced, but it appears that AMD is trying to tout its third-generation Barcelona chips as a better overall value rather than compete on raw high-end speed.

AMD's Opterons were at least partially instructive because it gave us a sneak preview of what we could expect from AMD's Phenom lineup. As Barcelona and Agena are based on the same K10 core architecture, these Opterons showcase what AMD has been working on for the past several years. Early Barcelona numbers have shown solid improvements over AMD's prior architectures and product lines.

AMD's Phenom lineup will be available in a lot of variants. The product lineup as it stands now will consist of the dual-core Phenom X2, quad-core Phenom X4, and quad-core Phenom FX (with multiprocessor capability, leading to octa-core systems for the ultra-premium market). The K10 architecture will also filter down to the Athlon 64 and Sempron processor lineups, as well, although it's not quite clear how these will fit into the mix yet.

AMD's Phenom X2 and Phenom X4 products run in AMD's new Socket AM2+, which is being used for most new Athlon 64 platforms. The Phenom FX, on the other hand, will run on a server-class Socket-1207+, which lets the processor run in a multiprocessor configuration. Power consumption levels will likely range between 68 and 89W for the Phenom X2 and X4 products, whereas the highly clocked Phenom-FX processors will likely range between 120 to 140 TDP.

## Good Things (Might) Come In Threes

There's another interesting twist to this product lineup that we haven't discussed yet, that being AMD's upcoming *triple-core* Phenom product, likely to be dubbed the Phenom X3. Developed under the codename Toliman, AMD is positioning this new tri-core product as an intermediate between its dual-core and quad-core product lineups, hoping to fill a gap in terms of performance and price. This processor line was not on the radar until a few months ago, which has led to some interesting theories as to why this processor came into existence.

One of the most commonly believed theories as to why AMD suddenly announced plans to bring a tri-core Phenom processor to market is that the company ran into production difficulties with its native quad-core processor design, where not all four cores are fully functional and/or able to clock up to their intended speeds. If this is indeed the case, AMD could simply shut off this nonfunctioning core and repackage it as a three-core product. It's also possible that AMD fabbed tri-core processors from scratch using its existing K10 design, although throwing a product into the mix months before its introduction makes this scenario unlikely. Because processors take an extremely long time to design, mask, and manufacture, suddenly deciding to bring such a product into existence would be quite impressive. Thus far, details—official or otherwise—have been scarce, which is the cause of much of the misinformation around the Web about this particular product.

Most consumers haven't imagined that a triple-core product could exist. Processors have always scaled in multiples of two (dual-, quad-, octa-), and having an odd-numbered amount of processors in a system just doesn't seem right. However, contrary to popular belief, triple-core systems are indeed possible today and can provide performance levels (as one would hope) right between dual- and quad-core systems with similar clock speeds and architectures. The most common way of doing this today is to purchase a multisocket motherboard with one dual-core and one single-core processor. If the chips run at the same clock speeds and voltage levels, motherboards and OSes should have no trouble detecting and running them properly.

As for software compatibility, both Windows and Linux can properly use triple-core hardware, just as they would for a dual- or quad-core system. Properly coded multithreaded software should scale across three cores on the same trajectory as it would for other dual-, quad-, and octa-core systems.

AMD is clearly testing the waters by diving into the market with tri-core processors. The price gap between dual- and quad-core processors is shrinking daily, as AMD's own quad-core Opterons are available starting at around $250. In order for tri-core processors to be feasible, AMD will have to demonstrate that they can fill the niche market between the dual- and quad-core lineups. It will be interesting to see if AMD will continue to produce tri-core Phenom X3 processors as Phenom X4 yields improve over the rest of the year and AMD's quad-core processors take off. Intel, for its part, seems to believe that there is not a market for tri-core processors.

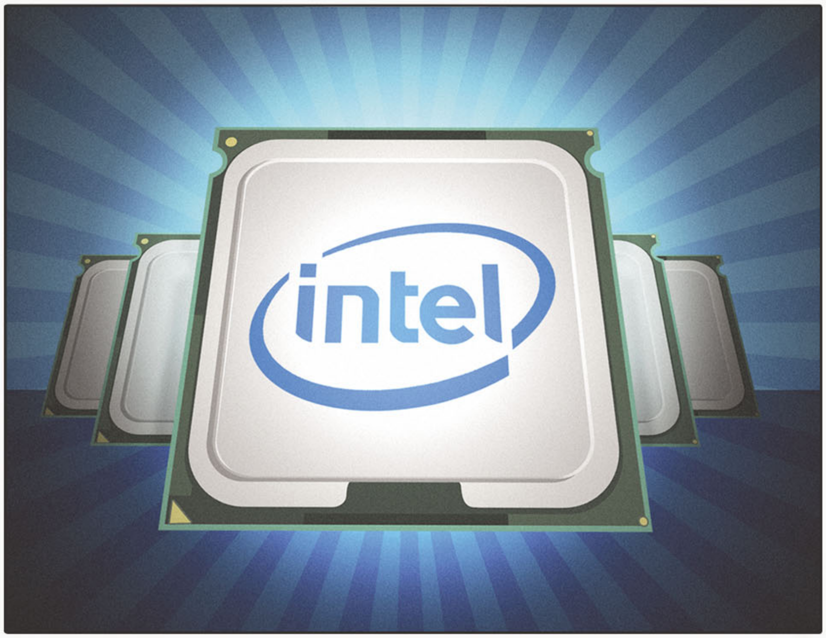
## Phenom's Phuture

All in all, AMD has a host of interesting technologies at its disposal and a solid architecture to base its products off of for the next few years. Whether K10 is enough to bring AMD back from the brink and compete once again with Intel is yet to be seen. At this point, it's up to AMD's manufacturing teams to crank up the clock speeds while keeping power and thermal levels under control. We're not finance majors, but Phenom could be the architecture that saves or sinks AMD. For the sake of competition, we're hoping for the former. ▲

**by Chris Connolly**

# THE POWER OF PENRYN

## The Details Of Intel's New Core 2 On The Block



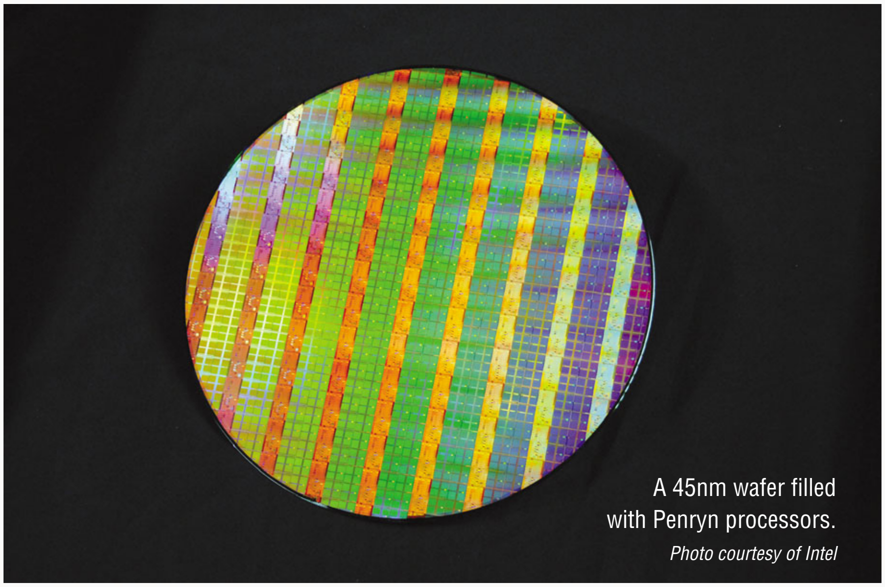
Once again, the clock is about to strike. Intel's long-standing "tick-tock" system of releasing a new core architecture or updating the manufacturing process of an existing generation has been operating with dead-on accuracy. As a company, Intel has been extremely efficient, rarely missing release dates. Intel's public image has once again softened, and enthusiasts have embraced its products. And Intel's processors have been consistently besting AMD's in terms of raw performance, price/performance, and performance per watt—three very important factors in today's marketplace. But even with the Core 2 architecture dominating the market for roughly the past three years, the heat is on to deliver a competitor that delivers better performance and more power efficiency in the face of a newly rejuvenated AMD.

Intel's pre-emptive strike against AMD's upcoming Phenom processor lineup is shaping up in a big way. For a company that stuck with the Pentium 4 architecture far too long (and, in the case of Prescott, took a step backward), Intel has made consistent improvements to its Core 2 architecture and brought those improvements to consumers with remarkable efficiency. This may be the case once again with Intel's upcoming generation of products. Intel's latest processor architecture, dubbed Penryn, is an umbrella name that encompasses its latest 45nm-based processors.

Penryn (named after a city just outside Sacramento, Calif.) isn't as groundbreaking or game-changing as the Core 2 architecture was when it was first released, but the modifications that Intel has fit into this architecture revision provide some exciting enhancements. Although the architecture is a derivative of the Core 2, the improvements we've seen thus far put Penryn in a whole other class than the Core 2.

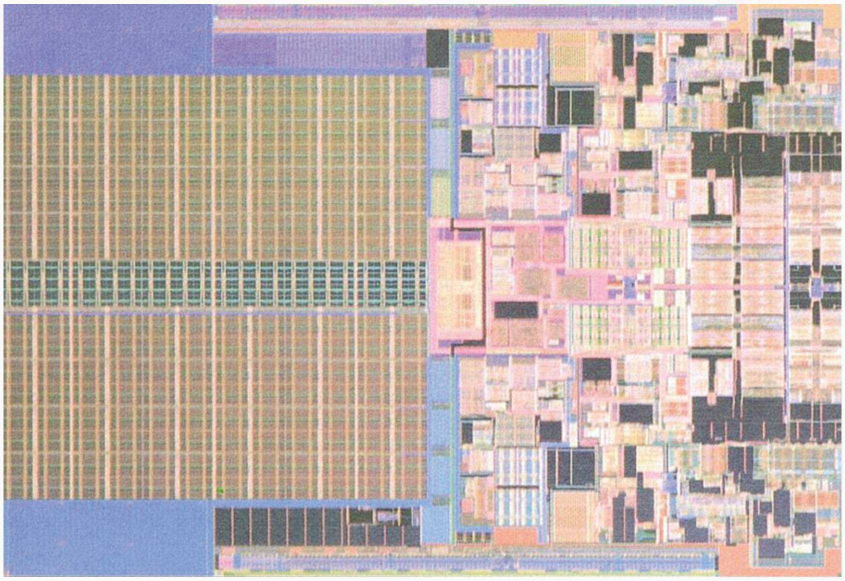
Penryn core technology reaches from the multisocket server arena to the lightweight mobile marketplace. From the top down, the following architectures are based on Penryn's design: Wolfdale-DP (dual-core Xeon), Harpertown (quad-core Xeon), Yorkfield XE (Core 2 Extreme), Yorkfield (Core 2 Quad), Wolfdale (Core 2 Duo), Penryn-QC (mobile Core 2 Quad), and Penryn (mobile Core 2 Duo). To simplify, Intel kept the same brands and platforms (Xeon, Core 2, Centrino) in place and simply infused them with Penryn technology. For most purposes, the name Penryn simply denotes a 45nm multicore processor based on an updated Core 2 architecture.

Like its predecessor, Conroe, Penryn is packaged in either a single-die or dual-die configuration. Each Penryn die is equipped with two cores; two of them packaged on the same processor allows for quad-core operation. Because of this, Penryn is still not a native quad-core



A 45nm wafer filled with Penryn processors.

*Photo courtesy of Intel*



Intel's Penryn at a glance. To the left, you can see the massive 6MB of cache that supports each die's two cores.

*Photo courtesy of Intel*

processor (as AMD is quick to point out). As we've seen, packaging two dual-core dies on a single platform let Intel enter the quad-core arena well ahead of AMD, and Intel's quad-core chips' performance have scaled extremely well. As far as AMD's touting of its native quad-core processors as the superior offering is concerned, take a look at "Multicore Slugfest" on page 66 for a complete breakdown of benchmark performance.

## Die-Shrink To Victory

Intel's move to a 45nm process is the key that made the Penryn architecture possible, as some of the components added to this new design simply wouldn't have been financially feasible with the previous generation's 65nm process. Thanks to the smaller process, Penryn has more on-die cache and performs better without having to compromise on die size or thermals. The Core 2 Extreme QX9650 marks Intel's maiden voyage of 45nm technology on the desktop, but 45nm chips will eventually become Intel's dominant platform. By 2008, Intel will have 45nm parts on the market for desktops, servers, and mobile PCs, although 65nm processors will be sticking around for a while. Intel is counting on three of its major chip fabrication plants to be producing 300mm wafers with 45nm cores in 2008.

"We expect 45nm will cross 65nm in volume in the second half of 2008," says Dan Synder, PR manager for Intel.

## The Cache That Keeps Climbing

Increased cache is one of Penryn's core benefits, as Intel has added 50% more L2 cache per core in comparison to the majority of Core 2 processors. Current-generation Core 2 dual-cores share 4MB of L2 cache and quad-cores pack 8MB, but Intel's Penryn-based processors have 6MB shared cache per dual-core and 12MB shared cache per quad-core. This large jump in cache size will likely improve overall system performance by 5 to 10% in comparison to previous Core 2 processors at the same clock speed. The larger amount of cache is more efficient, as well, as Penryn chips utilize a 24-way set associative cache, a 50% improvement over Conroe-based processors' 16-way associative cache. Early tests have shown that Intel has also improved the latency of the cache, as well, which will also help performance overall.

The increase in cache greatly increases the transistor count of Penryn-based processors, but thanks to the improved process technology, it doesn't mean a large increase in overall die size. Today, a Core 2 Quad processor has 582 million transistors (291 million per die); a quad-core Penryn processor will have 820 million transistors (410 million per die), roughly a 40% increase in raw number of transistors. This makes Penryn by far the most complex consumer-level processor released to date. Intel estimates the overall die size of a quad-core Penryn to be at 214mm$^2$, compared to 286mm$^2$ of its previous quad-core processor.

## Bigger Bus, Better Instructions

In addition to adding cache to the Penryn lineup, Intel also pushed increases in terms of the FSB speed. The original Core 2 Duo was available at FSB speeds of 800MHz and 1,066MHz and finally ended its life at 1,333MHz. Intel's first-generation Penryn processors launched at 1,066MHz and 1,333MHz but will quickly ramp up to a 1,600MHz FSB to work in conjunction with the upcoming X38/48 chipsets and DDR3-1600 memory modules. Intel will likely have 1,600MHz FSB processors available for high-end desktops, workstations, and servers, but we're unlikely to see this in the mobile space any time soon. Intel's processors have been able to handle far higher FSB speeds through overclocking, so we certainly believe it's feasible for Penryn to scale to 2,000MHz front side bus speed and beyond.

But improvements in cache and platform connectivity speed aren't the only upgrades to Intel's new architecture. Intel made the processor core smarter, as well, with the addition of SSE4 instructions. SSE4 (also called SSE 4.1) comprises 47 new instructions, which appear to largely be focused on graphics, 3D imaging (including gaming), and video encoding/processing. Intel claims that with the use of new SSE4 instructions, applications see major improvements in encoding speed. Some of the new instructions are also targeted at search, gaming, and physics applications, but it's unlikely that we'll see anything making major use out of these new instructions until developers can design applications that take advantage of the new instructions. Early Intel (and independent sources) benchmarks of DivX encoding using these new instructions showed very solid performance benefits compared to a non-SSE4-equipped processor, however.

"SSE4-enabled applications demonstrate large double-digit performance gains," says Snyder.

Although some of Intel's Core 2 lineup wasn't equipped with virtualization acceleration and Execute Disable support, Intel equipped all Penryn processors with both technologies. In addition, Intel beefed up its virtualization speed, claiming up to 75% improvements in certain scenarios.

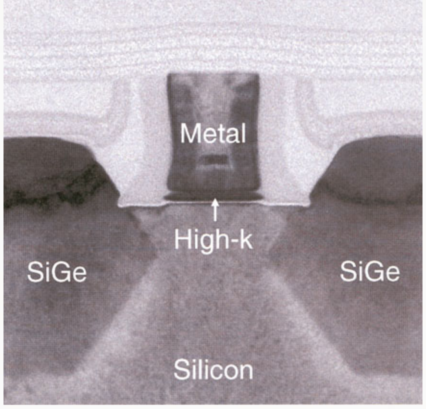
## The Power Predicament

Power consumption has become an important concern recently, and both Intel and AMD are hard at work on the ever-daunting task of improving performance while delivering the same (or lower) level of power consumption and heat output. With Penryn's more power-efficient 45nm manufacturing process, Intel's dual-core and quad-core processors based on this design will fit in the same power envelope as prior generations. Depending on the clock speed and number of cores, Intel is releasing Penryn processors with thermal levels (under load) ranging from 40W for energy-efficient models to up to 130W TDP for the highest-clocked Extreme Edition models, while the majority of processors will hover at 65W and 90W TDP levels. This means that Intel won't have to modify its cooling systems to handle these new chips, and overall power consumption numbers won't change much between generations.

Intel also introduced a new technology for its Penryn-based mobile processors. Deep Power Down Technology affects a processor's sleep state by flushing the cache and cutting power to the processor cores and L2 cache, while the chipset maintains power for memory traffic. This combination lets Penryn CPUs run at lower power levels compared to prior generations.

## Other Improvements

One of the most interesting aspects we've seen with Penryn thus far is a new technology that Intel has dubbed EDAT (Enhanced Dynamic Acceleration Technology). The goal of this technology is to improve single-threaded application performance on a multicore processor. With this technology enabled, the system will be able to detect if a single-threaded application is only utilizing one of the cores while idling another. When this is the case, EDAT-enabled systems will be able to boost the clock frequency of the primary processor core handling the single-threaded application while (basically) powering down the secondary core in order to keep power and heat levels in check. This is an interesting technology, especially if users will have the ability to control this processor function or even assign it to be enabled for certain games or applications.



The high-k metal gate technology is one of the biggest improvements to processor design in 40 years.

*Photo courtesy of Intel*

Perhaps the most significant architectural improvement is Intel's new 45nm high-k gate manufacturing process. The technology replaces the silicon gate and silicon dioxide dielectric with a metal gate and halfnium-based insulator. The result is greatly reduced transistor leakage, letting Intel shrink its processor dies without wasting energy. Ultimately, the new gate dielectric should result in less than one-tenth the leakage. The technology should also let future versions of Penryn run at much higher clock speeds.

Although Penryn will scale further than today's 65nm dual- and quad-core processors, the first processors will likely range from 2 to 3GHz. The fastest Conroe-based Core 2 processors are clocked at 3GHz, which means that Intel will rely on the amount of processor cache, latency improvements, and new instruction sets to deliver better performance per clock. We should note, however, that Intel has shown off quad-core systems functioning at 3.33GHz, and it's generally expected that Penryn should be able to scale into the 4GHz range over time, should Intel want to push the chip's limitations before its next-generation Nehalem processor is released next year.

Penryn is slated to use Intel's standard sockets for workstations, desktops, and mobile PCs. However, Penryn has different power requirements compared to today's Core 2 processors, so today's motherboards may not work with new Penryn models. Many new Socket 775 motherboards hitting the market support Penryn out of the box, but older motherboards will be hit or miss. Compatibility will depend on your motherboard's BIOS and if the VRM components are compatible with Penryn's required voltage levels.

"The Intel 3 Series/Bearlake family is designed for 45nm CPU support," says Snyder. "Within the Intel 3 Series chipset, however, not all FSBs and processors are 'officially' supported by each chipset variant. For example, the entry-level Intel P31 chipset will not be validated by Intel to support the faster FSBs and quad-cores, as seen in high-end processors such as the quad-core Core 2 Extreme.

"Third-party motherboard vendors will try to overcome any chipset limitations with motherboard engineering. As always, check each motherboard vendor for CPU compatibility."

## The Name Game

Although naming schemas can quickly change before release, at this time, it appears that Intel will be using Q-series to describe their quad-core Penryn releases, whereas dual-core Penryn releases will be sold as the E-series. The top-of-the-line model will likely be the QX9650 quad-core Penryn, which will run at 3GHz with 2x 6MB L2 cache (12MB total), which will have the highest TDP rating of the bunch at 130W.

The more mainstream quad-core components will be the Q9300, Q9450, and Q9550 models, which will run at clock speeds of 2.5GHz, 2.66GHz, and 2.83GHz, respectively. All three will have a 95W TDP level, although only the two high-end models will have a full 12MB of L2 cache, whereas the Q9300 model will have half that at 6MB L2 cache (2x 3MB per core).

Dual-core Penryn models will be the E8200, E8300, E8400, and E8500 models. Each of these processors will have a single dual-core Penryn die and run at clock speeds of 2.66GHz, 2.83GHz, 3GHz, and 3.16GHz. All of these processors will have a 65W TDP level and will have 6MB of L2 cache. It's likely that these processors will fit into Intel's current pricing system. Top-of-the-line Extreme Edition processors sell for around $1,000; the midrange quad-cores should range between $400 and $800; and the dual-core models should range between $200 and $400.

It's very likely that we'll see other releases based on this architecture, as well, although if Intel does go through with this launch schedule, it will have very competent chips across the board to battle against AMD. If Intel can nail the price tag of the Q9450 (quad-core 2.66GHz with 12MB of cache), we feel that this release is shaping up to be the strongest from a price/performance point of view.

Intel will also be moving Penryn technology into its Xeon processor lineup and into notebooks under the Core 2 Duo Mobile names. All indications are that Intel will introduce Penryn-based processors for workstations and servers through the Xeon family by the end of 2007. High-end desktop Penryn chips have already been released into the wild, but the mass arrival of Penryn isn't expected to take place until early 2008, meaning that this new architecture will largely miss the critical holiday buying season. On the other hand, this helps Intel clear out its current inven-tory before the massive Penryn launch.

It will certainly be interesting to see how Intel's hepped-up Core 2 design will fare against AMD's freshly designed quad-core processors. Penryn's design, while powerful and efficient, is not a huge overall change from the prior generation, whereas AMD's is. It's a gamble not pushing clock speeds to much higher levels from the get-go for Intel, but it feels confident in its launch plan.

And even if AMD's upcoming Barcelona processors turn out to be a hit, Intel still has a little chip called Nehalem on the horizon, which is already running in Intel's labs and is scheduled for release in late 2008/early 2009. Until that time, though, it's Intel's market to lose. ▲

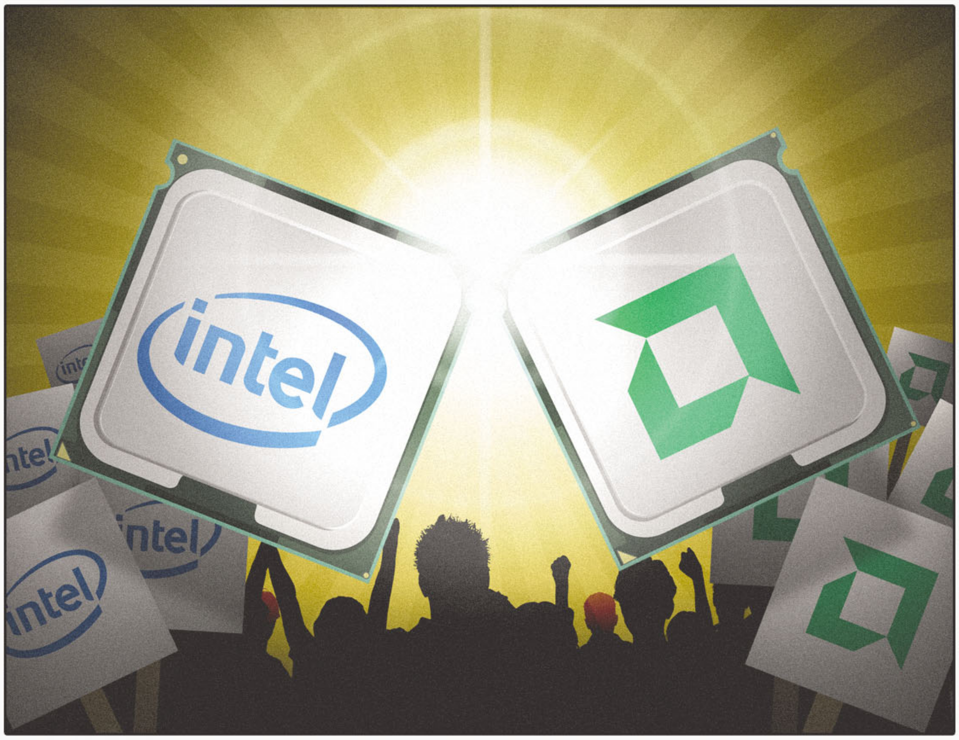
**by Chris Connolly**

Here's where the magic happens: Intel's Fab 32 in Chandler, Ariz.

*Photo courtesy of Intel*

# MULTICORE SLUGFEST

## A Challenger Rises, But Can It Unseat The Incumbent?



As 2007 drew to a close, both Intel and AMD unleashed processors based on entirely new execution cores. Intel introduced a family of processors based on the Yorkfield core, which is a derivative of the company's much-talked-about 45nm Penryn microarchitecture. And AMD launched its native quad-core Phenom processors, which are based on the Agena core and are derived from the company's Barcelona microarchitecture. Yorkfield is a multichip module consisting of a pair of Wolfdale dual-core dies linked together via the processor's packaging, while AMD's Agena is a native quad-core design that features all four execution cores on a single die.

With both processor giants releasing new product lines, we thought it was the perfect time to gather up some of the hottest hardware available and build a couple of ultimate systems around Intel's and AMD's latest flagship processors. We know you turn to *CPU* for your fix of cutting-edge PC goodness. Well, here it is, folks. We present you with our Ultimate Intel Core 2 Extreme and AMD Phenom rigs.

### Share & Share Alike

This year's ultimate rigs share a few common system components. A pair of shiny new ATI Radeon HD 3870 graphics cards running in CrossFire push the pixels in each system. The decision to go with AMD's latest graphics cards was a tough one, because at press time, Nvidia's GeForce 8800 Ultra still ruled the roost in terms of 3D

AMD's ATI Radeon HD 3870 is the first graphics card to offer support for DirectX 10.1 and PCI-E 2.0. When coupled with the right motherboard and drivers, these cards can be used in one-, two-, three-, or even four-card CrossFireX multi-GPU configurations.

## The Parts List

| | Ultimate Intel Extreme | | Ultimate AMD Phenom | |
|---|---|---|---|---|
| | | Price | | Price |
| **CPU** | Core 2 Extreme QX9650 | $999 | Phenom 9700 | $299 |
| **Motherboard** | Asus Maximus Extreme | $329 | Gigabyte GA-MA790FX-DQ6 | $250 |
| **Memory** | Corsair TWIN3X2048-1800C7DF (2) | $579 (x 2) | Corsair TWIN2X2048-8888C4DF (2) | $529 (x 2) |
| **Graphics Cards** | Radeon HD 3870 (2) | $249 (x 2) | Radeon HD 3870 (2) | $249 (x 2) |
| **Hard Drives** | Western Digital WD7500AAKS (2) | $189 (x 2) | Western Digital WD7500AAKS (2) | $189 (x 2) |
| **Power Supply** | Ultra X3 1,000W | $239 | Ultra X3 1,000W | $239 |
| **Optical Drives** | Lite-On LH-20A1L-06 | $37 | Lite-On LH-20A1L-06 | $37 |
| **Total Cost:** | | **$3,638** | | **$2,759** |

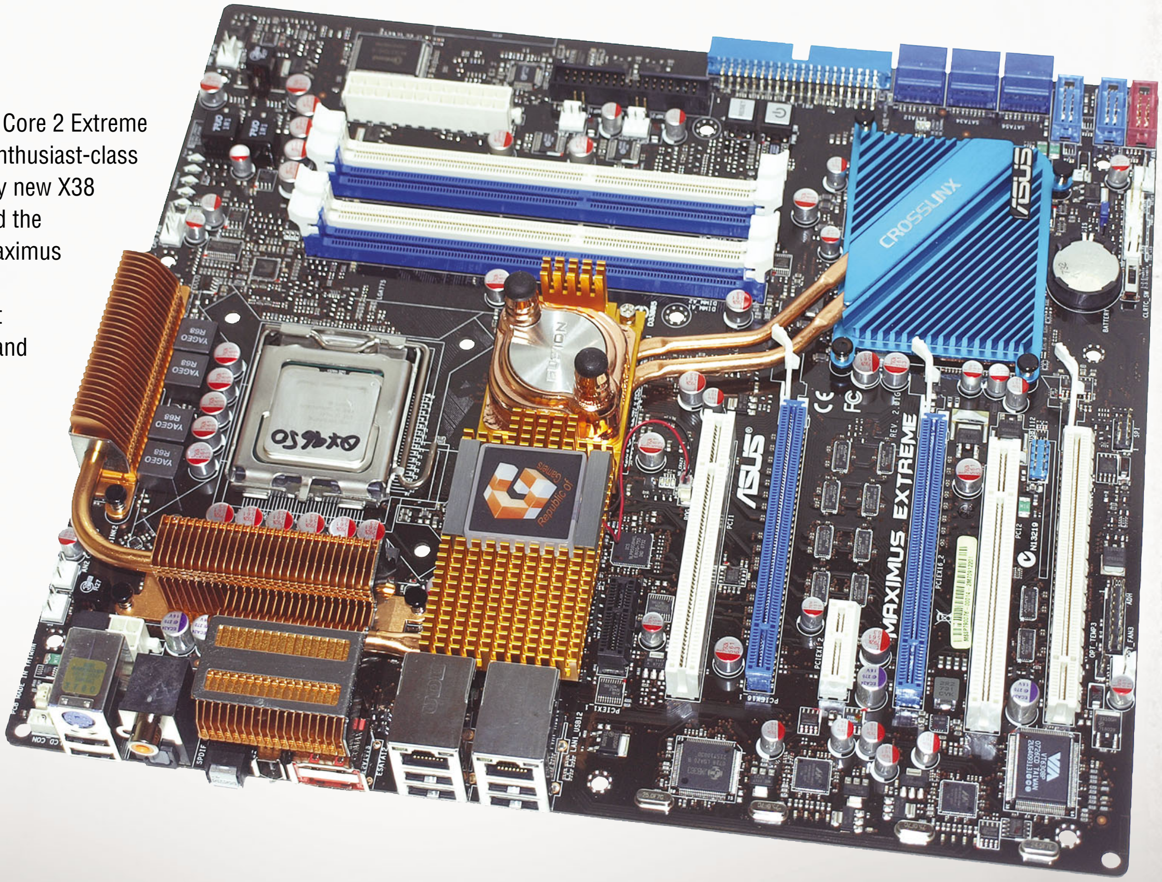
gaming performance. But taking advantage of two 8800 Ultras in SLI meant using an nForce chipset, and Nvidia's next-gen nForce chips weren't quite ready for prime time when we went to press.

And we weren't interested in pairing today's hottest processors with yesterday's core logic, so that meant using the X38 Express chipset for the Intel rig and the 790FX chipset for the AMD system. If you want to run multiple GPUs on these chipsets, the Radeon HD 3870 is the current cream of the crop. It may not be the fastest graphics card on the market, but it's plenty fast for all of today's games. It also features support for DirectX 10.1 and PCI-E 2.0. Each card features 512MB of 2.2GHz GDDR4 and a 55nm RV670 GPU clocked at 775MHz. The RV670 is much like the R600 that lies at the heart of the Radeon HD 2900 XT, but with a tweaked memory controller and 55nm process. The Radeon HD 3870 also supports CrossFireX and can be run in three- and four-card configurations, provided the motherboard has the correct slot setup and chipset support.

A pair of beefy Western Digital 750GB WD7500AAKS Caviar SE16 hard drives configured in a RAID 0 was also common to both of our ultimate systems. We toyed with the idea of using a pair of 10,000rpm Raptors but decided to go with a balance of capacity and performance. Finally, we dropped a 1,000W Ultra X3 modular PSU into both machines.

### Ultimate Intel Extreme Rig

We built our ultimate Intel Extreme rig around Intel's current flagship desktop processor, the Core 2 Extreme QX9650.



If you want to pair a Core 2 Extreme with an Intel-built, enthusiast-class chipset, the relatively new X38 is the way to go. And the fully loaded Asus Maximus Extreme offers all of the features inherent to the X38 chipset (and then some).

As we've already mentioned, the QX9650 is based on the 45nm Yorkfield core. It has a whopping 12MB of shared L2 cache, supports SSE4 instructions, and comes clocked at 3GHz with a 1,333MHz FSB. This core clock and FSB are identical to the Core 2 Extreme QX6850 it supplanted as the head of Intel's current product stack, but the enhancements to the core result in significant clock-for-clock performance benefits with some applications, especially those that take advantage of SSE4.

The motherboard in our ultimate Intel Extreme rig was Asus' Maximus Extreme. The Maximus Extreme is the newest member in Asus' Republic of Gamers lineup of high-end motherboards. In addition to exploiting all of the features inherent to the X38 chipset, the Maximus Extreme sports a number of additional technologies, such as Crosslinx, for a more flexible PCI-E lane configuration, and Asus' Fusion cooling system, which can cool the motherboard's chipset and VRM using either air or liquid. It also supports CrossFire and has a BIOS loaded with features.

The final piece of the puzzle for the ultimate Intel Extreme rig was some high-end Corsair DDR3. To wring the most performance from a Core 2 processor, you need as much memory bandwidth as possible. To that end, we employed two 2GB TWIN3X2048-1800C7DF memory kits in the system. This memory is rated for operation at 1,800MHz at CAS 7, which results in some major bandwidth.

## Ultimate AMD Phenom Rig

Powering our ultimate AMD Phenom rig was the fastest quad-core desktop processor available at the time of launch, the 2.4GHz Phenom 9700. In addition to a host of core enhancements designed to increase IPC (instructions per clock) performance and improve internal bandwidth between functional blocks on the chip, the Phenom 9700 boasts 2MB of shared L3 cache, 2MB of L2 cache (512K per execution core), and support for HyperTransport 3.0. Phenom processors also have a number of features geared toward power efficiency, such as dynamic clock gating on a per-core basis; CoolCore technology, which disables the

## Performance: The Ultimate, Side By Side

In addition to the system specs we've listed, we also made an effort to ensure each ultimate rig had a similar software configuration before we benchmarked each system. Our ultimate Intel Extreme and AMD Phenom rigs both ran Windows Vista Ultimate with a set of prerelease ATI Catalyst drivers (version 8.43) that supported the Radeon HD 3870 cards. We completely patched the OS and installed the latest DirectX redist and Microsoft multi-GPU (kb936710) and virtual address space (kb940105) hotfixes.

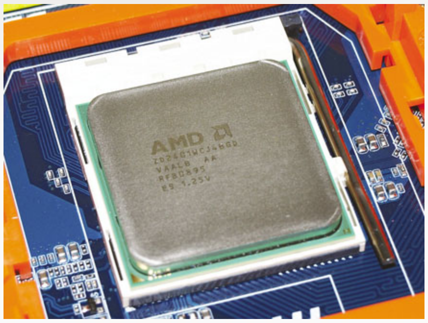
We should also note that we took a few steps to tweak each system's performance as we thought most power users would, without significantly overclocking the rigs. With the Ultimate Intel Extreme system, we dropped the CPU's multiplier to 7 and raised the FSB to 450MHz to get the Corsair DDR3 RAM to run at its rated speed of 1,800MHz. These changes resulted in a 3.1GHz CPU clock speed.

With the Phenom rig, we manually clocked the system's DDR2 memory to run at 1,066MHz in Ganged Mode via the BIOS and also enabled Bank Swizzle Mode, which gave us the best memory performance. On both systems, we also set the memory timings and voltages manually to match each kit's rated specifications. We also auto-tuned the Radeon HD 3870 graphics cards via ATI's Overdrive utility and settled on 850MHz GPU and 2.4GHz memory frequencies.

As you look through the benchmarks, you can't help but notice the Intel rig's dominance in the scores. Please keep in mind, however, that the Intel rig's QX9650 processor, motherboard, and high-end DDR3 RAM make the system about $1,200 more expensive than the Phenom-based system. That extra coin buys a whole lot of performance, but it's also a large amount of money that can go toward a number of worthwhile upgrades. ▲

**by Marco Chiappetta**

| | Ultimate Intel Extreme | Ultimate AMD Phenom |
|---|---|---|
| SiSoft SANDRA XIIc 2008 | | |
| ***Processor Arithmetic*** | | |
| Drystone ALU (Mips) | 58,221 | 36,743 |
| Whetstone iSSE3 (Mflops) | 45,949 | 31,032 |
| ***Processor MultiMedia*** | | |
| Integer (iitps) | 409,897 | 91,927 |
| Floating Point x4 iSSE2 (fitps) | 190,270 | 120,716 |
| ***Memory Bandwidth (Buffered)*** | | |
| RAM Bandwidth Integer iSSE2 (MBps) | 9329 | 5759 |
| RAM Bandwidth Float iSSE2 (MBps) | 9299 | 5773 |
| Futuremark PCMark05 | | |
| CPU Performance Module | 10,148 | 6,713 |
| Memory Performance Module | 7573 | 4416 |
| Futuremark 3DMark06 | | |
| CPU | 4864 | 3363 |
| Overall | 17,471 | 13,731 |
| LAME MT | | |
| Single-threaded (min:sec) | 0:43 | 1:13 |
| Multithreaded (min:sec) | 0:29 | 0:49 |
| Sony Vegas (min:sec) | 2:53 | 4:19 |
| Cinebench R10 | | |
| Single-threaded (min:sec) | 4:17 | 6:56 |
| Multithreaded (min:sec) | 1:11 | 1:53 |
| Crysis SP Demo | | |
| CPU Benchmark (800 x 600, low quality) | 121.11fps | 66.11fps |
| GPU Benchmark (1,600 x 1,200 high quality) | 24.25fps | 15.02fps |

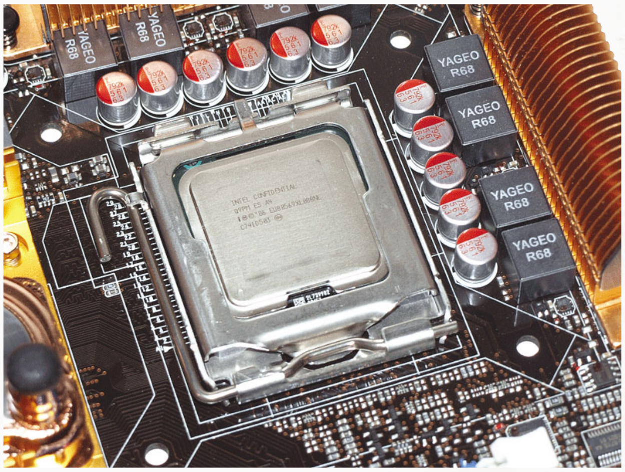


Feast your eyes on AMD's native quad-core Phenom 9700 processor. With that heat spreader, it doesn't look much different than an Athlon 64; but rest assured, there's an entirely different beast under that hunk of metal.

## A Peek At The Processors

Both giants will head into 2008 swinging, and virtually nothing about each company's top offering, save execution cores, is the same. Here's a look at the crucial specs. ▲

| | **Core 2 Extreme QX9650** | **Phenom 9700** |
|---|---|---|
| **Core** | Yorkfield | Agena |
| **Socket** | T (LGA775) | AM2+ |
| **Frequency** | 3GHz | 2.4GHz |
| **FSB** | 1,333MHz | N/A (HT 3.0) |
| **L1 Cache** | 256KB (64KB x 4) | 256KB (64KB x 4) |
| **L2 Cache** | 12MB (6MB x 2) | 2MB (512K Per Core) |
| **L3 Cache** | N/A | 2MB |
| **TDP** | 130W | 125W |
| **Price** | $999 | $299 |
| **CPUs** | ●●●● | ●●●◐ |



The first Penryn-derived desktop quad-core processors are based on the Yorkfield core. As of press time, the 3GHz Core 2 Extreme QX9650 was the company's flagship.

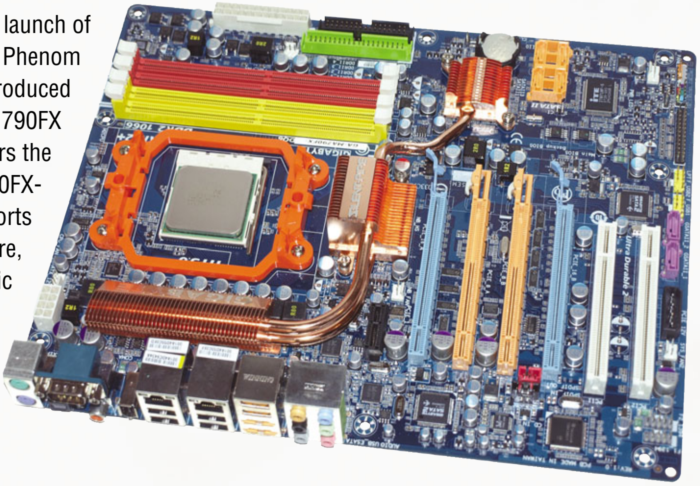
functional blocks of each core when not in use; and Dual Dynamic Power Management technology, formerly referred to as split power planes.

To take advantage of all of Phenom's new features, you need a motherboard with an AM2+ socket and a chipset designed with the above features in mind. We got just that and more from Gigabyte's GA-MA790FX-DQ6. The GA-MA790FX-DQ6 is based on AMD's own 790FX chipset, which supports HyperTransport 3.0, DDR2-1066 memory, PCI-E 2.0, and CrossFireX. The 790FX chipset sports an impressive 42 PCI-E lanes, so running a pair of graphics cards in CrossFire means both cards get a full 16 lanes of electrical connectivity. Slap four cards in a system for four-way CrossFire, and each card still has eight dedicated lanes at its disposal. The GA-MA790FX-DQ6 also sports an impressive cooling system and a system BIOS geared toward advanced users.

Memory from Corsair also made its way into our ultimate AMD Phenom rig. Due to their integrated memory controllers, AMD's processors are particularly sensitive to memory latency. We wanted to use memory that was not only capable of high clock speeds but also able to operate with low latencies. Corsair's TWIN2X2048-8888C4DF fit the bill perfectly. This memory can run at 1,111MHz at CAS 4, which makes it some of the fastest, lowest-latency DDR2 on the market. We used a couple of 2GB TWIN2X2048-8888C4DF kits for our ultimate AMD rig. ▲

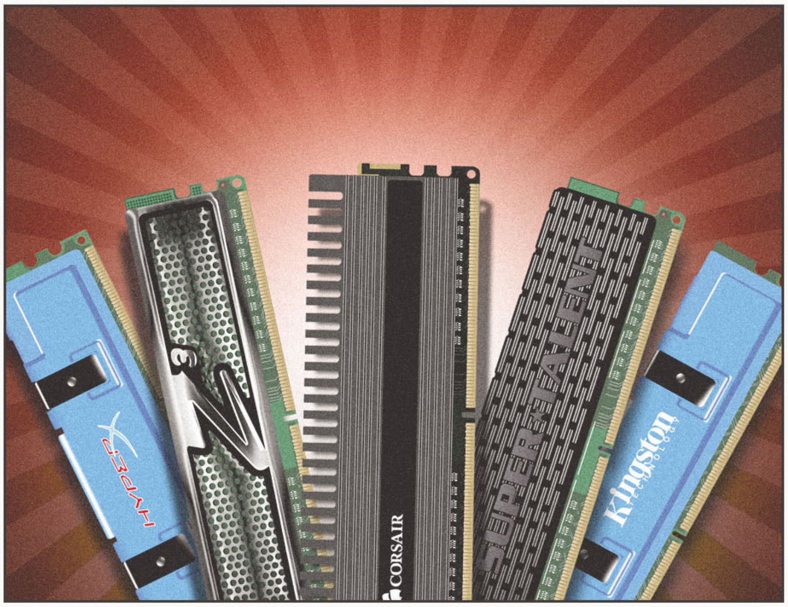
**by Marco Chiappetta**

To coincide with the launch of its native quad-core Phenom processors, AMD introduced the enthusiast-friendly 790FX chipset, which powers the Gigabyte GA-MA790FX-DQ6. The 790FX supports HT 3.0, Quad CrossFire, and Dual Dynamic Power Management.



# DDR3 DASH

## Five Bandwidth-Busting Kits Strut Their Stuff



To coincide with the launch of P35 back in May 2007, most of the major players in system memory introduced DDR3 memory kits to support Intel's new chipset. It was a scenario much like 2004, when Intel first launched core logic chipsets with support for DDR2 memory. At launch, the newer DDR3 system memory was much more expensive, but due to relatively high latencies compared to more mature DDR2 offerings, there was little or no performance gain using DDR3. In 2004, many analysts recommended users stay away from DDR2 for as long as possible because it simply wasn't a better value than DDR. Now, as Yogi Berra said, "It's like déjà vu all over again."

Unlike DDR2, which took a couple of years to mature, DDR3 memory kits have rapidly ramped up in clock speed while offering lower latencies than initial DDR3 products. DDR3 kits are still quite expensive, but after only a few months since the technology's debut, some DDR3 memory kits are threatening to break the 2GHz barrier. Others can run at CAS 5 at speeds well beyond any DDR2 kit.

We procured dual-channel, 2GB kits from Corsair, Super Talent, OCZ, and Kingston. Together, the kits represent a blend of speeds and timings, and we used these differences to show how clock speeds and timing affect performance. Our test rig included Intel's P35 chipset with a Core 2 Duo processor, which has a 1,333MHz FSB to fully exploit the performance potential of each kit. All prices listed are street prices according to Pricegrabber and were current at the time of this writing.

### Corsair TWIN3X2048-1800C7DF

Although based on DDR3 memory, Corsair's TWIN3X2048-1800C7DF kit shares the same cooling technology as its DDR2-based Dominator-branded counterparts. There are four key things at work in Corsair's Dominator memory kits. We've covered the Dominator's cooling technology before, but if you need a refresher, turn to the February 2007 issue of *CPU*. (See pages 66 to 69.)

The culmination of Corsair's efforts is a 2GB memory kit that's rated for operation at 1,800MHz with 7-7-7-20 timings (CAS-TRCD-TRP-TRAS). We should note that the TWIN3X2048-1800C7DF operates at 2V; many other DDR3 kits require only 1.7 to 1.8V.

At 1,800MHz, the Corsair TWIN3X2048-1800C7DF is one of the highest-clocked DDR3 memory kits currently available. Despite an already high default clock speed, the kit also had plenty of overclocking headroom left. Ultimately, it put up the best performance scores. At about $650, though, the TWIN3X2048-1800C7DF kit is also one of the most expensive. It's tough to justify spending 650 bucks on a 2GB memory kit, but considering the current field of DDR3

**TWIN3X2048-1800C7DF**
$650
Corsair
www.corsairmicro.com
●●●●

## DDR3 Specifications

| | Corsair TWIN3X2048-1800C7DF | Super Talent W1600UX2G7 | OCZ OCZ3P1600EB2GK | Kingston KHX11000D3LLK2/2G | Kingston KHX11000D3ULK2/2G |
|---|---|---|---|---|---|
| **Capacity** | 2GB (2x 1GB) | 2GB (2x 1GB) | 2GB (2x 1GB) | 2GB (2x 1GB) | 2GB (2x 1GB) |
| **Rated Frequency** | 1,800MHz | 1,600MHz | 1,600MHz | 1,375MHz | 1,375MHz |
| **Timings (CAS-TRCD-TRP-TRAS)** | 7-7-7-20 | 7-7-7-18 | 7-6-6-24 | 7-7-7-15 | 5-7-5-15 |
| **Required Voltage** | 2V | 1.8V | 1.9V | 1.7V | 1.8V |
| **Cooling** | DHX heatsinks | Cast aluminum HE heat spreader | Platinum XTC heat spreaders | Aluminum heat spreaders | Aluminum heat spreaders |
| **Warranty** | Lifetime | Lifetime | Lifetime | Lifetime | Lifetime |
| **Price** | $650 | $469 | $559 | $455 | $720 |
| **CPUs** | ●●●● | ●●●● | ●●●●◐ | ●●● | ●●● |

kits, you do get what you pay for. If money's no object and you're in the market for a high-end Intel-based rig, you can't go wrong with this kit.

**W1600UX2G7**
$469
Super Talent
www.supertalent.com
●●●●

### Super Talent W1600UX2G7

The underlying memory chips used on the Super Talent W1600UX2G7 memory kit—Micron's Z9—are similar to those OCZ, Corsair, and quite a few other memory manufacturers use. Super Talent does a few things to differentiate the W1600UX2G7 kit from its competition, however. For one, the Super Talent W1600UX2G7 DIMMs were the only ones to feature a heatsink on only one side of the PCB. Super Talent claims that there's no need to affix a heatsink to both sides (and increase costs) when there are no chips on the reverse side of the PCB.

We'd also like to draw attention to the reason we're referring to Super Talent's cast aluminum HE (high-efficiency) heat spreaders as heatsinks. Yes, they are thin and mostly flat, but the heatsinks used on the Super Talent DIMMs feature small, raised fins that increase surface area and dissipate heat more effectively than completely flat heat spreaders.

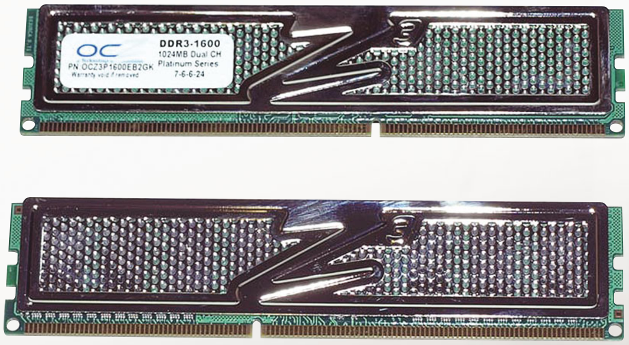
As its model name alludes to, the W1600UX2G7 memory kit is rated for DDR3-1600 speeds and consists of a matched pair of 1GB DIMMs. Other specifications include latencies of 7-7-7-18 at only 1.8V.

Super Talent has been receiving a lot of attention from power users as of late. And considering the performance and competitive pricing of its W1600UX2G7 kit, that attention is well-earned. At approximately $469, the W1600UX2G7 kit is a good value in light of its competition. The W1600UX2G7 kit also overclocked well. If a DDR3 memory kit is in your future, the Super Talent W1600UX2G7 is worthy of your consideration.

### OCZ OCZ3P1600EB2GK

Our entrant from OCZ in this roundup is the OCZ3P1600EB2GK 2GB memory kit. Rated for operation at 1,600MHz, the kit includes latencies of 7-6-6-24 and a moderate 1.9V voltage requirement.

The matched pair of 1GB DIMMs used in the OCZ3P1600EB2GK kit are outfitted with OCZ's XTC (Xtreme Thermal Convection) heat spreaders, which feature a perforated honeycomb design that increases heat dissipation by letting air circulate through the heat spreader and to the PCB and chips beneath. We should also note that the OCZ3P1600EB2GK kit features OCZ's EVP (Extended Voltage Protection). EVP lets overclockers increase the memory voltage without invalidating OCZ's



**OCZ3P1600EB2GK**
$559
OCZ
www.ocztechnology.com
●●●●◐

## Entering The FSB Stratosphere

We benchmarked the memory kits in this roundup on a test system running Windows XP Pro SP2, a 2.66GHz Intel Core 2 Duo E6750 processor, a P35-based Asus Blitz Extreme motherboard, and a GeForce 8800 GTX.

To run each of the memory kits at their rated frequencies, we used a combination of CPU multiplier, memory divider, and FSB manipulation. We made an effort to keep the CPU running as close to its default frequency as possible in every instance, but because of each memory kit's different rating, it was impossible to keep the processor locked at a consistent clock speed and achieve maximum memory performance. We listed the CPU multiplier, FSB frequency, and final CPU clock speed for each kit in the charts. Please note: We broke the testing into two groups; the first includes performance scores at each kit's rated frequencies and timings, while the second is made up of the benchmark scores posted by each kit while overclocked to its absolute limit. ▲

### Performance At Rated Frequencies, Timings & Voltages

| | **Corsair TWIN3X2048-1800C7DF** | **Super Talent W1600UX2G7** | **OCZ OCZ3P 1600EB2GK** | **Kingston KHX11000 D3LLK2/2G** | **Kingston KHX11000 D3ULK2/2G** |
|---|---|---|---|---|---|
| **Memory Frequency** | 1,800MHz | 1,600MHz | 1,600MHz | 1,333MHz | 1,333MHz |
| **CPU Multiplier/ FSB/CPU Clock** | 6/450MHz/2.7GHz | 7/400MHz/2.8GHz | 7/400MHz/2.8GHz | 8/333MHz/2.66GHz | 8/333MHz/2.66GHz |
| ***SiSoft SANDRA XI SP1*** | | | | | |
| Memory Bandwidth Benchmark Integer (MBps) | 8227 | 7806 | 7864 | 6880 | 6965 |
| Memory Bandwidth Benchmark Floating Point (MBps) | 8230 | 7836 | 7859 | 6885 | 6990 |
| Memory Latency Benchmark | 63 | 69 | 67 | 77 | 74 |
| ***Futuremark PCMark05*** | | | | | |
| Memory Performance Module | 6711 | 6709 | 6748 | 6149 | 6219 |
| ***F.E.A.R.*** | | | | | |
| 640 x 480 (Low-Quality) | 243 | 271 | 279 | 232 | 259 |

### Performance At Maximum Overclocked Speeds At 2.2V With Rated Timings

| | **Corsair TWIN3X2048-1800C7DF** | **Super Talent W1600UX2G7** | **OCZ OCZ3P 1600EB2GK** | **Kingston KHX11000 D3LLK2/2G** | **Kingston KHX11000 D3ULK2/2G** |
|---|---|---|---|---|---|
| **Memory Frequency** | 1,916MHz | 1,712MHz | 1,733MHz | 1,476MHz | 1,468MHz |
| **CPU Multiplier/ FSB/CPU Clock** | 7/479MHz/3.3GHz | 7/428MHz/2.99GHz | 7/433MHz/3GHz | 8/369MHz/2.95GHz | 8/367MHz/2.95GHz |
| ***SiSoft SANDRA XI SP1*** | | | | | |
| Memory Bandwidth Benchmark Integer (MBps) | 9234 | 8355 | 8463 | 7319 | 7446 |
| Memory Bandwidth Benchmark Floating Point (MBps) | 9290 | 8389 | 8434 | 7370 | 7453 |
| Memory Latency Benchmark | 61 | 64 | 66 | 73 | 70 |
| ***Futuremark PCMark05*** | | | | | |
| Memory Performance Module | 7930 | 7174 | 7270 | 6699 | 6733 |
| ***F.E.A.R.*** | | | | | |
| 1,024 x 768 (Low-Quality) | 314 | 296 | 301 | 284 | 278 |

lifetime warranty. In the case of this kit, that's 1.95V.

As is usually typical of OCZ's high-end memory, the OCZ3P1600EB2GK memory kit strikes a good balance between performance and price. Although the OCZ3P1600EB2GK kit is still expensive compared to even some of the fastest DDR2 kits, it offers one of the best values here. For about $559, the OCZ3P1600-EB2GK kit offers good stock performance, somewhat lower latencies, and decent overclocking headroom. Corsair's kit overclocked to higher speeds; one of Kingston's kits has tighter timings; and the OCZ3P1600EB2GK kit lies somewhere in between.

### Kingston KHX11000D3LLK2/2G

The Kingston KHX11000D3LLK2/2G memory kit is quite different from the others represented here. The KHX-1100D3LLK2/2G (and its sibling in this roundup) uses different memory chips than its competitors, and the difference is painfully clear. This kit isn't rated for clock speeds as high as Corsair's, OCZ's, or Super Talent's. The likely reason? The kits from Corsair, OCZ, and Super Talent employ Micron memory chips, but the Kingston kits use Elpida chips.

If you take a trip over to Kingston's Web site, it shows DDR3 memory kits with a different heat spreader design than what we have pictured, but the KHX11000D3LLK2/2G kit we tested features the same basic blue aluminum heat spreaders of Kingston's DDR2 HyperX product line. We want to point this out strictly to avoid confusion (and fear) when browsing the Kingston Web site, as the heat spreaders used were more than capable of handling the heat produced by these DIMMs.

The KHX11000D3LLK2/2G kit is a matched pair of 1GB DIMMs rated for operation DDR3-1375. This kit's default timings and voltage are 7-7-7-15 and 1.7V, respectively.

Looking at the specifications and benchmark scores, it may be easy for this memory kit to get lost in the mix. For starters, it doesn't offer the highest clock speeds or the tightest timings. And its performance in the overclocking department doesn't compare to the competition. But these are also the main reasons why the KHX11000D3LLK2/2G is the least expensive of the group (at about $455).

If you want a relatively affordable DDR3 memory kit and don't plan to push it too far past the official 1,333MHz maximum clock speed supported by Intel's current chipsets, the KHX11000D3LLK2/2G will serve you well. However, we'd definitely recommend investing a bit more if you're going to be doing any overclocking.

**KHX11000D3LLK2/2G**
$455
Kingston
www.kingston.com
●●●

## Kingston KHX11000D3ULK2/2G

If you didn't pay attention to the model number decals affixed to the Kingston kits' heat spreaders, the KHX11000D3ULK2/2G memory kit looks just like the KHX11000D3LLK2/2G upon initial inspection. The KHX11000D3ULK2/2G is somewhat different, though, at least from a performance standpoint.

**KHX11000D3ULK2/2G**
$720
Kingston
www.kingston.com
●●●

Similar to the KHX11000D3LLK2/2G memory kit, Kingston's KHX11000D3ULK2/2G kit is rated for DDR3-1375 speeds. This memory kit also features the same heat spreaders. Where the Kingston KHX11000D3ULK2/2G kit differs, though, is in regard to its timings. At the expense of a slightly higher operating voltage (1.8V), this kit supports much lower latencies of 5-7-5-15. One of the major complaints regarding early DDR3 memory samples was their relatively high latencies. That's not an issue with this kit. At CAS 5 at 1,375MHz, the KHX11000D3ULK2/2G features some of the lowest latencies of any high-speed DDR3 memory kit.

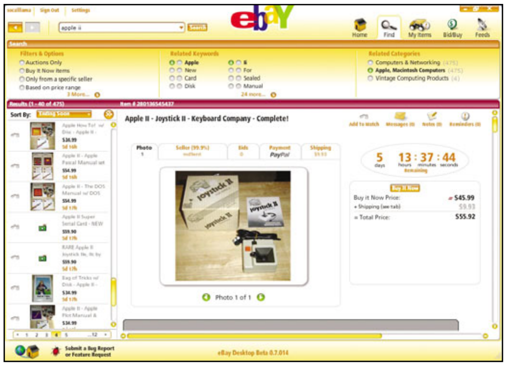
For those interested only in stock performance, the Kingston KHX11000D3ULK2/2G is an interesting product. With its low latencies and support for DDR3-1375 speeds, this kit offers great stock performance for those not looking to push clock speeds too high. But there are a couple of caveats. The KHX11000D3ULK2/2G is extremely hard to find, and even if you can find it, it's usually priced at approximately $720. And because it uses inferior Elpida chips, overclocking performance was subpar. In our opinion, that's simply too much to pay for a memory kit with only a 2GB capacity that can't overclock to speeds of less expensive offerings. ▲

**by Marco Chiappetta**

# The Bleeding Edge Of Software

## Inside The World Of Betas

## eBay Desktop Beta



**Official Product Name:** eBay Desktop Beta
**Version # Previewed:** 0.7
**Publisher:** eBay
**Developer and URL:** eBay, www.ebay.com
**ETA:** Q2 2008
**Why You Should Care:** Given the horsepower, it changes the way you eBay.

To many people, eBay is more than just a Web site; it's a way of life. That said, up until now, eBay really was just a Web site, so the only way to interact with it was though the Web browser. Web browsers are good, of course, but there are interface limitations that even AJAX features can't completely overcome, so the eBay Desktop hopes to change the face of Internet auctions with a standalone application that works directly with eBay, with promising results.

eBay Desktop is one of the first big desktop applications made with the Adobe Apollo Project, which has recently been released as the Adobe Integrated Runtime, or AIR. AIR lets developers make Web-aware applications with Flash, Acrobat, and an HTML editor such as Dreamweaver with relative ease and speed, which explains why the eBay Desktop has been developing so rapidly. It might also explain why the app is sluggish on older PCs—there may be a lot of overhead associated with the AIR platform, or there's still a lot of debugging code in the beta.

On a speedy machine, eBay Desktop changes how you work with eBay. It parses auctions into tabbed sections of a single page, for example, and the countdown timer automatically updates in real time until the "final hammer" of any auction. Browsing The Bay involves expanding categories rather like the Column View in the Macintosh Finder, and it feels "obvious" after just a few minutes of browsing.

Being a desktop application, it can persistently check on things. For example, a Taskbar tray icon constantly monitors watched items and items you're bidding on.

eBay Desktop is intended to be a free application, and the beta is free to check out, as well. ▲

**by Warren Ernst**

## AIMP2

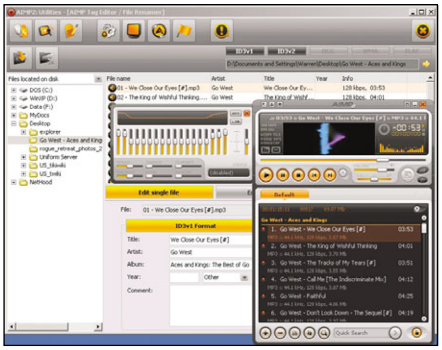
There are two 900-pound gorillas in the software MP3 player market, Winamp and iTunes, but they aren't the only players you should seriously consider. Media Monkey is the highly regarded "everything and the kitchen sink" alternative to iTunes, and AIMP2 is probably the best Winamp-fighter out there, but the latest beta is starting to blur the lines between "lightweight" and "full-featured." We love it anyway.

Initially looking very much like Winamp ("to increase familiarity," say its Russian developers), AIMP2 is an excellent-sounding player. It seems AIMP2's developers had an eye on Winamp when creating AIMP2, and they attempted to overcome all of Winamp's annoyances and shortcomings while maintaining its speed and small memory footprint. Based on that criteria (the entire download is about 3MB), AIMP2 is a rousing success, though there is the occasional bug due to its "beta-ness."

The main AIMP2 window has buttons to pop up a playlist and equalizer, but each seems supercharged compared to Winamp, offering more information or sliders, for example. Global Hotkeys (which let you directly control playback even when AIMP2 isn't the focused window) and active crossfading are built-in; no plug-ins required.

A powerful set of utilities comes with AIMP2, including a CD Ripper, a sound recorder (records all audio throughput from any source and can natively create MP3s, OGGs, WAVs, and WMAs), and a powerful ID3 tag editor and file renamer. There are also quick links to the Windows File Explorer and a language switcher that includes almost 20 languages.

AIMP2 seems ideal for small notebooks, as it works beautifully in low-RAM, low-CPU, and low-screen resolution environments. On standard PCs, it's small enough to run in the background without causing stutters, even when the foreground app is an FPS game. Once the bugs get chased out, AIMP2 should be a winner. ▲



**Official Product Name:** AIMP2
**Version # Previewed:** 2.05.2 Beta
**Publisher:** Artem Izmaylov
**Developer and URL:** Artem Izmaylov, www.aimp.ru
**ETA:** Q1 2008
**Why You Should Care:** Perhaps the best lightweight MP3 player available for Windows.

**by Warren Ernst**

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*"Powered Tom's Hardware ultimate "High-End" overclocking system." - TomsHardware*

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*"The PCP&C Silencer is an amazing unit. The Silencer managed to breeze through our tests without even flinching. Rail stability was excellent, exhibiting little or no fluctuation what so ever." - OC3D*

*"PC Power & Cooling has a reputation in the industry to make the best PSUs out there - without any sacrifices." - TechPowerUp*

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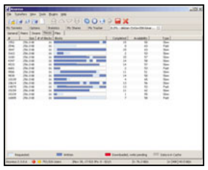
# UP TO SPEED

## Upgrades That'll Keep You Humming Along

Two multimedia heavyweights, Roxio and Nero, launch the latest salvoes in their ongoing battle of the super-suites this month. And the Wii gets keyboard support, as well.

## Software Updates

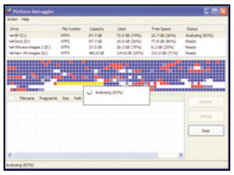
### Azureus 3.0.3.4



The latest version of this torrent client adds an All Peers view to the interface. It also squashes multiple bugs when dealing with some UPnP routers and the MacOS.

azureus.sourceforge.net

### Defraggler 1.00.031 Beta



A free, recently released file defragmentation tool from the makers of CCleaner adds a debug mode and an option to save a list of defragged files. Better error messages and a fix for crashes involving 4GB files on FAT32 files come to this version, as well.

www.defraggler.com

### Easy Media Creator 10

The mega-suite of multimedia editors from Roxio now lets you capture and edit HD video, upload video to YouTube with one click, and convert multiple songs into a new format simultaneously. This update also gives you more control over iPods and lets you create custom profiles for your mobile phone.

www.roxio.com

### FileZilla for Windows v3 3.0.2.1

The ubiquitous FTP client fixes a problem with the message log.

filezilla-project.org

### Firefox 2.0.0.8

The latest version of Mozilla's browser fixes some security issues involving how browser links were launched. It is now compatible with Leopard (Mac OS X 10.5). Several new languages gain support, including a beta release for Kurdish.

www.mozilla.com

### Flock 0.9.1

Even as this perennially upcoming "social browser" circulates a 1.0 beta privately, Flock's open beta gets refreshed with (count 'em) 16 issues resolved for the blogging function, 35 issues fixed in Favorites management, and a whopping 86 problems corrected in the general browser.

www.flock.com

### Foobar2000 0.9.5 Beta 1

The popular audio player gets a new interface and album list component. Look for improved conversion features, as well as updated audio format decoding. Windows XP or later is required, however.

www.foobar2000.com

### MediaMonkey 3.0.0.1091 Beta

The ace media library and player for massive collections gets a host of fixes, including to the burner operations and the Album Leveling feature. The Edit Hotkeys feature now works in Now Playing window, and a glitch in Album Art Details has been resolved.

www.mediamonkey.com

### Nero 8 Ultra Edition

The Nero media-making suite adds better Vista support and more hi-def Blu-ray/HD DVD support. A StartSmart project launcher puts more functions in a single console. And new support for Xbox 360 and PS3s lets you stream multimedia content across PC and game platforms in the house.

www.nero.com

### Tor for Windows 0.2.0.8 Alpha

The anonymizer for Web browsing, messaging, and other Internet tasks fixes a longstanding crash bug and some memory leaks. The Windows bundle now includes the Torbutton development feature, version 1.1.8.

Tor.eff.org

### VMware Player 2.0.2.59824

The software that lets you run virtual machines on a PC fixes problems running under AMD Duron processors. This version also resolves an issue when Ubuntu 7.04 virtual machines can power off unexpectedly.

www.vmware.com

## Driver Bay

### ATI Catalyst Suite 7.10

The newest Radeon drivers add Adaptive Anti-Aliasing for the X1000 series of cards and CrossFire support for the HD 2600/3400 series. Look for speed improvements in several games under DX10 Crossfire modes.

www.amd.com

### Creative Sound Blaster X-Fi for Vista 2.15.0002

The latest audio drivers support the X-Fi Crystallizer, CMSS 3D, MIDI, EAX, PCM output, Line-in, SPDIF pass through, and recording in Vista. It does not support Dolby and DTS decoding, DVD-Audio, DirectSound-based EAX, and 6.1 speakers.

www.creative.com

### Wii 3.1

New firmware for the Nintendo game console adds USB keyboard support to make the messaging and Web browsing already available easier.

www.nintendo.com

**by Steve Smith**

# Spy vs. Spy

## When It Comes To Antispyware, The More, The Merrier

Almost all PC users, from rank noobs to the most jaded gurus, have one thing in common: They use the Internet. That means we're all exposed to adware and spyware, and some users are even more likely to get into serious trouble since they spend a lot of time boldly going where no surfer has gone before. No matter who you are, you need antispyware, and you need a lot of it.

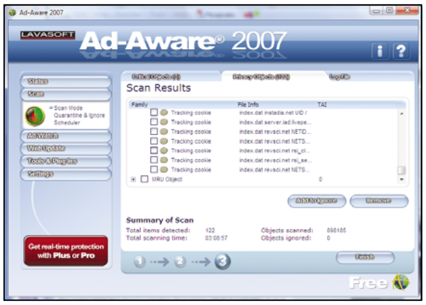
### The Setup

We tested all of the software on a Windows XP machine that was purposely infected with spyware. Fortunately for antispyware users, that series of tests turned out to be dull—all of the scanning packages were able to detect and eliminate all of the critical threats thrown at them and varied only slightly in detecting various noncritical threats such as tracking cookies.

In a second round of tests, we ran the software on a Vista machine. This PC had a typical combination of antispyware installed, including Spyware Blaster, Windows Defender, and Spybot Search & Destroy, so we tested to see if the other software would find anything those freeware apps missed. We include Microsoft's Windows Defender in our chart as a point of comparison for the other applications we reviewed. Once again, the objective tests ended up as a yawn-fest: With few exceptions, the products varied only in the number of cookies they flagged as potential threats. The programs do vary significantly in terms of their interfaces, update methods, and other features, and a few packages emerged as clear leaders relative to the pack.

### Ad-Aware 2007 Free

Ad-Aware has always been a solid performer, and now that it is wrapped in a shiny new interface and incorporates some scanning engine updates, it's even better. The freeware version we tested does not have real-time protection, although that can be added by upgrading to the Plus or Pro versions. It does support automatic updates for the scanning engine, which is very thorough. The software does a good job of dividing its findings into a Critical Objects category vs. a Privacy Objects category so that benign cookies are not flagged as major threats. Scans can only be scheduled in the Plus and Pro versions, so if you decide to use Ad-Aware, we recommend upgrading to a commercial version, as there are other freeware utilities available that have much better features.



Scan Results

| Family | File Info | TAI |
|---|---|---|
| ☐ Tracking cookie | index.dat instadia.net UID / | |
| ☐ Tracking cookie | index.dat server.iad.livepe... | |
| ☐ Tracking cookie | index.dat revsci.net NETID... | |
| ☐ Tracking cookie | index.dat revsci.net NETS... | |
| ☐ Tracking cookie | index.dat revsci.net rsi_cl... | |
| ☐ Tracking cookie | index.dat revsci.net rsi_se... | |
| ☐ Tracking cookie | index.dat revsci.net NETS... | |
| ☐ MRU Object | | 0 |

Summary of Scan
Total items detected: 122
Total scanning time: 03:08:57
Objects scanned: 898185
Objects ignored: 0

Don't even bother with the free version of Ad-Aware—the commercial versions run rings around it and are well worth the cash.

**Ad-Aware 2007 Free**
Lavasoft
Free; $26.95 Plus version
www.lavasoftusa.com
● ● ● ◖

### CounterSpy

CounterSpy looked great out of the gate but was ultimately lapped by some of the other programs in terms of usability. It has a nice interface that is packed with customization options and incorporates a scanning engine that didn't miss a beat during testing. Its main problem turned out to be an oversensitive active protection monitor, which popped up frequently with warnings that were difficult or impossible to dismiss. In most cases, telling the software to allow a certain program to change a Registry entry required several clicks, and when our GameTap gaming application tried to update itself, CounterSpy wouldn't let us dismiss the active protection warning at all. We had to shut down CounterSpy completely before GameTap could continue. This Chicken Little behavior is unacceptable—especially for expert users who know which programs are safe to add to a whitelist.

**CounterSpy**
Sunbelt Software
$20 for the first year; $15 per year thereafter
www.sunbelt-software.com
● ● ●

### Spybot Search & Destroy

Much like Ad-Aware, Spybot S&D has been a go-to freeware antispyware package for years now, but it's in serious need of an update. The real-time protection still works wonderfully, and the scanner catches all major threats without spitting out many false positives, but the interface makes it a chore to use. Auto updates and automatic scans are not supported, which is off-putting considering freeware packages such as Spyware Terminator now support those features. Of course, power users may prefer to do things by hand so that the software isn't spiking CPU usage at a critical time. Overall, this is still a good program as long as you remember to regularly update it and run scans manually, but there are better options if you want a superior interface and better features.

**Spybot Search & Destroy**
Patrick M. Kolla
Free
www.safer-networking.org/en/index.html
● ● ● ●

### Spy Sweeper

Aside from some sporadic performance issues, Spy Sweeper turned out to be one of the best commercial antispyware packages tested. The scanning engine does a thorough job, the real-time protection pops up only when necessary and is easy to manage, the interface is outstanding, and it is highly

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ● ● ◖ 2.5 = ABSOLUTELY AVERAGE | ● ● ● ● ● 5 = ABSOLUTELY PERFECT

configurable. It's one of the few packages in this roundup that has an integrated keylogger detector, although there are plenty of free and commercial standalone keylogger detectors available if you want to augment other programs with this protection.

On our Vista machine, the real-time protection system on average used very few CPU cycles but would occasionally spike to use 50% or more of the CPU. Considering the detection abilities, automation, configurability, and other features this package offers, it would make a great choice for PCs that you want to put on autopilot as far as antispyware is concerned. We recommend testing it out on your main PC to see if it uses fewer resources than it did on ours, because overall, its mix of detection ability, real-time protection, and other features is hard to top.

**Spy Sweeper**
Webroot Software
$29.95 for one-year subscription
www.webroot.com
●●●●◖

## Spyware Doctor

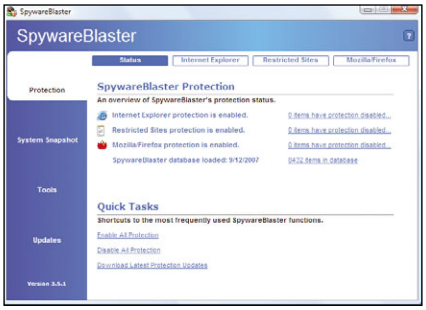
It was a close call between Spy Sweeper and Spyware Doctor for top honors in this roundup, but the nod goes to Spyware Doctor for its slicker interface and outstanding detection abilities. The scanning engine rooted out everything in all of our tests without reporting any false positives, and the real-time protection tools are outstanding. The software can monitor your Web browser, files, network, processes, and startup folder in real time while also detecting keyloggers, which is a task that few other antispyware programs do. It works great after a fresh installation, but there are plenty of options for power users to tinker with that are all arranged very neatly in a Settings tab. Spyware Doctor sets the bar for what a commercial application should be: accurate and powerful enough to please a power user, but simple enough to use that anyone can benefit from it.

**Spyware Doctor**
PC Tools Software
$29.95 for one-year subscription
www.pctools.com
●●●●●

## Spyware Blaster 3.5.1

Spyware Blaster is one of the few programs we tested that belongs on every single PC you use, because there are absolutely no performance downsides to consider. That's because it doesn't perform active scans or actively intercept threats, but instead uses a variety of methods to seal off vulnerable areas of the PC so threats can't materialize in the first place. It restricts Internet Explorer from accessing known bad sites, for example, and closes a number of security loopholes that the most prevalent threats use to gain access to the system.

Spyware Blaster should never be used by itself, but instead should work in conjunction with a real-time detection and scanning package to dramatically boost overall security. Get an auto-update subscription and this is one of



SpywareBlaster Protection
An overview of SpywareBlaster's protection status.
Internet Explorer protection is enabled. 0 items have protection disabled...
Restricted Sites protection is enabled. 0 items have protection disabled...
Mozilla/Firefox protection is enabled. 0 items have protection disabled...
SpywareBlaster database loaded: 9/12/2007 8432 items in database

Quick Tasks
Shortcuts to the most frequently used SpywareBlaster functions.

You'll need to use Spyware Blaster in conjunction with active antispyware utilities, but it offers great passive protection.

## Sizing Up Antispyware

So many antispyware packages to choose from. . . . Which one is the right one? And is one enough? Check out our highlights for each of the programs we reviewed. ▲

| | Ad-Aware 2007 Free | Counter Spy | Spybot Search & Destroy | Spy Sweeper | Spyware Blaster |
|---|---|---|---|---|---|
| **Price** | Free | $20 first year; $15 per year thereafter | Free | $29.95 per year | Free |
| **Scan Detection and Cleaning** | Excellent | Excellent | Excellent | Excellent | Excellent |
| **Interface** | Excellent | Good | Poor | Excellent | Excellent |
| **Configurability** | Good | Excellent | Good | Excellent | N/A |
| **Autoupdates** | No* | Yes | No | Yes | No* |
| **False Positives** | Minimal | Many* | Minimal | Minimal | Minimal |
| **Keylogger Detection** | No | No | No | Yes | Yes |
| **Real-Time Protection** | None (available in Plus version) | Too Sensitive | Excellent | Excellent | Excellent |
| **Passive Lockdown** | No | No | No | No | Yes |
| **Automated Scan** | No (free);<br>Yes (commercial) | Yes | No | Yes | No |
| **Comments** | A nice interface update makes a good app even better, but stick with the commercial versions | Good protection but requires too much babysitting | Among the best freeware packages, as long as you remember to update it | CPU usage can spike to high levels, but an excellent overall solution | A must-have for every computer, but be sure to use a program with real-time protection alongside it |
| | *Available in Plus and Pro versions | * During real-time protection | | | *Available for $10 per year |
| **CPU Rating** | ●●●◖ | ●●● | ●●●● | ●●●●◖ | ●●●●◖ |

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT the few pieces of antispyware software you'll never have to touch after the initial configuration.

**Spyware Blaster 3.5.1**
Javacool Software
Free; $9.95 per year for an auto-update subscription
www.javacoolsoftware.com/spywareblaster.html
●●●●◖

## Spyware Terminator

This is an especially robust package considering it's freeware. Nearly all of the real-time shield settings can be configured separately, allowing for a high degree of customization, and it's easy to schedule scans for whatever time works best. Best of all, users can enable automatic updates, which is a real rarity with free software, and it's designed to integrate with the freeware Clam AntiVirus package to provide total antispyware and antivirus protection for your PC.

Both the real-time protection and scanner worked well in testing, remaining unobtrusive while catching all of the threats we threw at it with very few false positives. If you use Clam, this software is a no-brainer, and even if you don't, it makes a good partner for any free or commercial antispyware you care to pair with it.

**Spyware Terminator**
Crawler
Free
www.spywareterminator.com
●●●●◖

## STOPzilla

STOPzilla was a great program back in the days when pop-up blockers weren't built into every browser (or available for free), but in today's environment, it lags a bit as an overall antispyware package. Scans took an extremely long time relative to most of the other packages, especially on the Vista machine, where we had to let it run overnight. During initial testing on the Vista PC, the software uncovered more than 100 threats that none of the other packages found, including infections by CoolWebSearch and Zlob.Yu, which are big problems.

In reality, all of these were false positives caused by protective Registry entries established by lock-down programs such as Spyware Blaster. The lock-down programs work partially by adding entries to the Zones section of the Registry, which stores a list of IP addresses and Web sites that are known to host spyware or other malware and restricts Internet Explorer from accessing those places. STOPzilla saw the restricted Web site names in the Registry, flagged each entry as a threat, and requested that we remove them, but in reality, those very settings were designed to protect the PC.

We contacted iS3 about the problem and were told that the software was designed to check the Zones area because certain malware can actually change Internet Explorer's restriction levels, making a site that is blocked become one that is granted full access to the system. Despite this, within 24 hours, the company pushed out an update for STOPzilla that prevents it from scanning the Zones section of the Registry, and the false positives were eliminated. Although the software works better after the update, the scanning speed is still slow enough that there are better commercial alternatives.

**STOPzilla**
STOPzilla
$19.95 for one-year subscription (with $20 mail-in rebate)
www.stopzilla.com
●●●

## This Porridge Is Too Cold

Ideally, we'd be able to push a button and destroy all rootkits, adware, spyware, keyloggers, and viruses in one fell swoop, while also immunizing the computer against future attacks. Nothing exists that can do that, but there are plenty of good software packages from which to choose.

For best results, use Spyware Blaster for its lockdown capabilities and add two antispyware programs with real-time detection. The ideal mix based on our testing consists of Spyware Blaster, Spyware Doctor, and Spy Sweeper.

The best way to deal with spyware is to prevent it from getting on your PC in the first place, so be sure to use a good pop-up blocker and consider using alternative Web browsers such as Firefox or Opera, as they are far less likely to be targeted by spyware programmers. Throw in a keylogger detector if the PC is in an environment where others can access it, and you should be good to go. At least until the malware programmers develop some new methods of infiltrating our PCs and we have to do this all over again. ▲

by Tracy Baker

| Spyware Doctor | Spyware Terminator | STOPzilla | Windows Defender |
|---|---|---|---|
| $29.95 per year | Free | $19.95 per year* | Free |
| Excellent | Excellent | Excellent | Poor (can't detect Trojans) |
| Excellent | Good | Good | Good |
| Excellent | Excellent | Excellent | Poor |
| Yes | Yes | Yes | Yes |
| Minimal | Minimal | Many | Minimal |
| No | No | No | No |
| Excellent | Excellent | Excellent | Excellent |
| | | | |
| Yes | Yes | Yes | Yes |
| Wonderful interface, terrific scanning engine, and works great for beginners or pros; our top pick | Commercial-level features in a freeware package | Slow scanning speed on both systems, and other packages are easier to use | Fully automated and extremely unobtrusive, but can't find Trojans |
| | | * With $20 mail-in rebate | |
| ●●●●● | ●●●●◖ | ●●● | ●●●● |

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

# Advanced Directory Comparison and Synchronization (ADCS) 1.21

There are a bevy of file synchronization tools for Windows, but if you've tried some that you feel are too simplistic, then ADCS is probably for you. Though it can be cryptic at times, it can perform tasks that other programs can't even dream of, and it works quickly and provides lots of details.

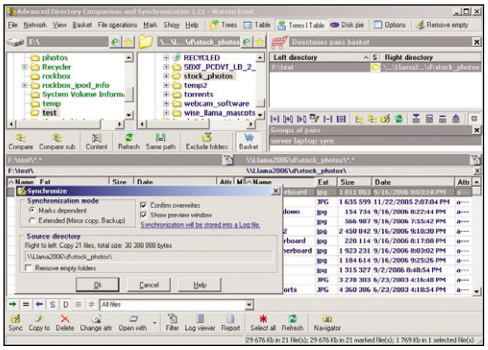
Though an afterthought with many programs, ADCS' Help file is very well written, which is a good thing since you'll probably be referring to it often at first to decipher cryptic toolbar buttons and unfamiliar terms. Start by selecting two folders, be they on your hard drive, network shares, removable media, or whatever. Add the selected pair to the Directory Pairs Basket (choosing either to keep track of subdirectories or not), and repeat the process until you've loaded all the directory pairs you want. Next, save the collection of pairs as a group (so as to sync these sets of folders later) and then run the Sync. A comparison table shows you what files are newer, which files will be copied in which direction, and so forth.

Other than the vocabulary, this is pretty typical of most sync programs, but ADCS breaks from the pack with many unique options that allow for jobs such as "Copy all files that are different from directories 'C:\My Documents' and 'D:\Backup\My Documents' to directory 'C:\Difference'" or by cleverly "syncing" the same directory twice, jobs such as "Delete all files with extensions .TMP, .BAK, .OLD, $$$ from disks 'C:\' and 'D:\.'" All that's needed is careful scrutiny of complex dialog boxes and a little imagination.

ADCS can also display folder sizes via a pie chart, but I found this feature lacking compared to other dedicated utilities. The chart itself isn't clickable, and the chart's labels tend to overlap each other, making them unreadable.

For those situations calling for many file synchronization options, ADCS is definitely the right tool for the job. ▲

**by Warren Ernst**



**Advanced Directory Comparison and Synchronization (ADCS) 1.21**
$32.92
Heatsoft
www.heatsoft.com
● ● ● ◖

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# SmoothWall Express 3.0

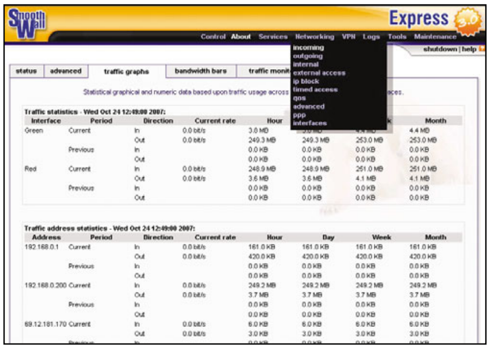
Hardware firewall/router units are basically ubiquitous these days and are for the most part very simple (though specialized) computers running a 200MHz processor and a small amount of RAM and frequently utilize a slimmed-down Linux operating system. They have attractive and simple Web browser-based interfaces and offer just enough features for most home/small office environments. SmoothWall Express 3.0, on the other hand, turns an ordinary (if not downright obsolete) computer into a full-blown, industrial-strength, Linux-based firewall/router that would make any IT guy happy, yet it maintains an attractive and simple browser-based interface that anyone can get a handle on.

As with most Linux projects, SmoothWall is free, but unlike most Linux projects, the included documentation (an installer's guide and a users guide) is well written and complete, making it totally usable for even a Linux neophyte. After downloading the ISO file and burning it to a CD, installing it to our test machine (a Celeron 400 with 384MB of RAM and a 60GB hard drive) took less than 30 minutes and absolutely no specialized networking knowledge at all, though it does totally reformat the drive. This isn't really a problem, as SmoothWall is intended to be a standalone appliance that doesn't even need a monitor once set up (it even beeps at the appropriate times during startup and shutdown). The stripped-down Linux distribution on which it's based has no extra services running, leaving no extra services to exploit, making SmoothWall very secure and lithe. Our ancient hardware never broke a sweat blocking ports and downloading from a 6Mbps DSL line.

SmoothWall does everything you'd expect from a Firewall (port forwarding and blocking, QoS, VPN) and some things you wouldn't (IM, email, FTP, Web proxying, throughput and bandwidth meters, full statistics, DNS server, and more), but it is certainly a step up in every way from any off-the-shelf unit.

Disadvantages are minor. Our low-rent hardware consumed 47 watts vs. a Linksys router's 8 watts (annual electrical cost of about $64 vs. $10), and PCs need hardware maintenance from time to time. Despite this, SmoothWall's combination of speed, price, ease, and security make it a winner. ▲

**by Warren Ernst**



**SmoothWall Express 3.0**
Free (Open Source)
The SmoothWall Open Source Project
www.smoothwall.org
● ● ● ● ◖

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ● ● ◖ 2.5 = ABSOLUTELY AVERAGE | ● ● ● ● ● 5 = ABSOLUTELY PERFECT

# Norton AntiVirus 2008

When stories are told of security utilities slowing down the PCs they're protecting, Symantec's products seem to take the brunt of the criticism. Symantec took steps to speed up its products with the 2007 versions, and its latest version of Norton AntiVirus, NAV 2008, goes even further. In our tests with both slow (P3 at 800MHz) and modern PCs, NAV 2008 proves to be no slower than NAV 2003, yet offers far more protection against far more threats at a price that's actually less if you take full advantage of its three-PC license.

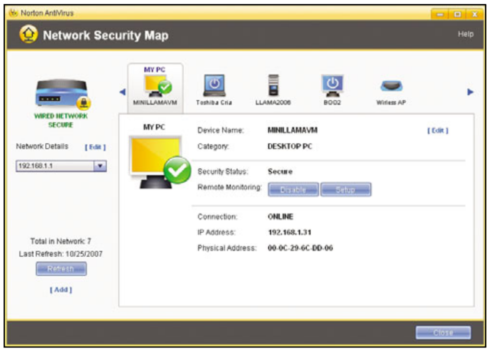
Of course, NAV 2008 will slow down any PC, as it's constantly checking files and monitoring network connections, but not in a way that's significantly different than its "lightweight" competition (AVG Free) or more robust competition (Kaspersky AntiVirus 7.0). NAV 2008 also consumes less background RAM than Kaspersky (9.2MB vs. 9.5MB), though more than AVG (2.5MB).

So (dare I say it), having successfully sped up NAV, Symantec was free to add more features, most of which are actually very useful yet a little surprising to find in a supposedly "straight AV" product instead of a security suite. In addition to the conventional foreground scanner and background monitor (both of which detect spyware in addition to viruses and certain rootkits), the inbound and outbound email scanner automatically checks instant messenger attachments, too. An inbound firewall actively looks for and blocks connections from worms, while also detecting (and optionally blocking) outbound servers listening on various TCP/IP ports. A new SONAR technology looks for virus-y executable file behavior in addition to comparing files to definition signatures, and a new Network Map displays machines on your LAN, though you must open the Network Map window yourself in order to check for unauthorized machines.

NAV 2008 is less chatty and annoying than past versions. Only occasionally does it prompt for action.

NAV 2008 is the best NAV we've seen in years and deserves consideration when you need a quality antivirus program. ▲

**by Warren Ernst**



Network Details
192.168.1.1
Total in Network: 7
Last Refresh: 10/25/2007
MY PC
Device Name: MINILLAMAVM
Category: DESKTOP PC
Security Status: Secure
Remote Monitoring:
Connection: ONLINE
IP Address: 192.168.1.31
Physical Address: 00-0C-29-6C-DD-06

**Norton AntiVirus 2008 (NAV 2008)**
$39.99
Symantec
www.symantec.com
● ● ● ●

# Norton Internet Security 2008

Norton Internet Security is the next step up from NAV 2008, adding to it a SONAR-based two-way firewall, an antiphishing component, and a password and personal data "locker" that fills out Web page forms automatically. These extra features run an extra $30 (or $10 per licensed PC), but NIS 2008 represents a great value over buying other standalone security utilities that offer this functionality. Though "heavier" than NAV, it isn't egregiously so, and it benefits from the new smarts Symantec has infused into its entire 2008 product line.

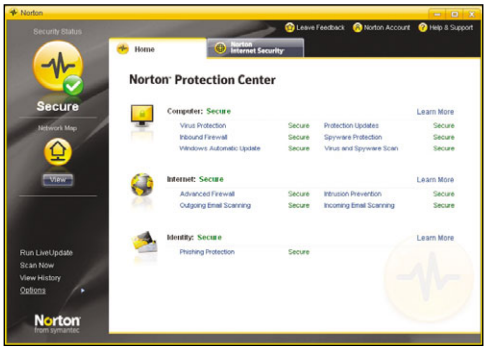
NIS 2008 added five more seconds to our slow system's boot time with NAV 2008, but drive-intensive tasks were no slower. The program's RAM consumption is odd: While actively protecting browsers or sometimes for no discernable reason at all, NIS 2008 consumes about 39MB of RAM, yet it's capable of reducing its memory footprint to 3MB or less at other times. (We saw this on four test machines.) Despite this, system speed was always quite good.

The two-way firewall follows NAV's lead by trying to not ask questions where the answers are obvious, and the results are impressive. It allowed Apache and MySQL servers to start and accept outside connections without prompting, yet blocked sample spyware silently. The well-laid out configuration screens (which are frustratingly hidden in the lower-left corner of the GUI) allow you to easily override the firewall's rules or automatic choices.

Norton's Phishing Protection and Identity Safe features live within the same browser toolbar, which for the first time is compatible with IE *and* Firefox. As before, the Phishing Protection refers both to Symantec's phishing site database as well as its own internal heuristics to block sites trying to steal your personal and financial information and, in our tests, block more sites faster than IE7's or Firefox's internal filters. Identity Safe stores all your Web site login and personal information within its own password-protected and encrypted data store and automatically fills in Web page forms with this information rather like RoboForm.

Traditionally, users looking to avoid bloat were to avoid Symantec's suites, but NIS 2008 blows that notion away. If you need more protection than NAV 2008 offers, then NIS 2008 is a good choice. ▲

**by Warren Ernst**



Norton Protection Center

Computer: Secure
Virus Protection Secure
Protection Updates Secure
Inbound Firewall Secure
Spyware Protection Secure
Windows Automatic Update Secure
Virus and Spyware Scan Secure

Internet: Secure
Advanced Firewall Secure
Intrusion Prevention Secure
Outgoing Email Scanning Secure
Incoming Email Scanning Secure

Identity: Secure
Phishing Protection Secure

**Norton Internet Security 2008 (NIS 2008)**
$69.99
Symantec
www.symantec.com
● ● ● ● ◖

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ● ● ◖ 2.5 = ABSOLUTELY AVERAGE | ● ● ● ● ● 5 = ABSOLUTELY PERFECT

## Dialogue Box

by Chris Pirillo

# How I Learned To Live With A Leopard

Since the release of Mac OS X 10.5 (Leopard), I've been bombarded with emails from would-be switchers. They want to know if Apple's new operating system really lives up to the hype. In my estimation, it surpasses the hype—more than Windows advocates care to admit. Then again, it doesn't take much to be better than Windows Vista these days.

A vast array of PC power users are content to cling onto irrelevant arguments and willful ignorance when asserting wild conclusions about "the other side." This is upsetting to me on several levels, not the least of which is that I myself was formerly a Windows advocate.

Cost is the first inaccurate volley. Are Macs really that much more expensive than other PCs? I suppose it's a valid point if you enjoy rifling through the bargain bins for discount parts to assemble your Linux PC. But if you're a gamer, all bets are off. When you're willing to spend $500+ on a new video card, cost is obviously not a pain point. Therefore, it's irrelevant in this discussion.

No matter, cost is always relative. Always.

"No software" is the second inaccurate allegation; not only is this typically unfounded, it's patently untrue. Simply claiming that your Windows software won't work on a Mac is ignorant; you can run many of those same win32 programs seamlessly alongside OS X apps within virtual machine software like Parallels or VMware Fusion.

There are many wonderful open-source, freeware, and shareware titles available for Leopard today. What's more, the threat of virus infection or spyware sabotage is almost nonexistent. Installing utilities on OS X is often as simple as dragging their icon into the Applications folder, with uninstallation routinely involving simply deleting that same icon. There may be more Windows titles available, but only a fraction of them are worth using.

Little market share is another big one. I've said it before: The tallest nail always gets pounded, so why wouldn't you want to be sitting on the shorter nail? Moreover, since when did the size of a user base become directly proportional to the software's true quality? Don't even get me started. If you're going to play the numbers game with me, then at least look at industry trends. There, you'll see the real story.

Apple deployed Leopard nearly two years after Tiger was released. Included with the upgrade was a host of new user-centric features and a noticeable speed boost for all software on the new platform. After an initial round of tests, I updated two more of my Macs to 10.5 without dealing with any kind of product activation or licensing nightmare.

Microsoft successfully unleashed Windows Vista after 5+ years of development, which has been running slower than Windows XP on the same hardware and boasts the marginally useful Flip 3D task switcher. After an initial round of tests, not only did I move back to XP, but I refused to let any other machine in my house run Vista. I continue to wrestle with users over Windows product activation and licensing headaches.

To add insult to injury, it's been said (by more than one person) that the best-performing Windows PC today happens to be a Mac with Boot Camp. If that doesn't close the case on overall performance questions, nothing will.

When you've actually owned an Apple computer running Leopard (and given it a fair shake), then you have every right to judge. However, what I find is that most OS X bashers have never bothered to touch a Mac. Worse yet, these people base their opinions on former factoids from another decade. Leopard is not perfect, but it's sitting at a more acceptable level of imperfection than the current state of Windows.

I virtually live in Redmond's backyard, yet I feel so much closer to Cupertino. Maybe that's because it seems they care more about my entire user experience? Even if that's not true for you, it certainly looks (and feels) that way to me. ▲

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**You can dialogue with Chris at chris@cpumag.com**

*Chris Pirillo's first exposure to an Apple computer was in grade school, when he was given proctored access to a ][e running Oregon Trail and other assorted educational goodies. Only after OS X's release did he find himself drawn into the world of Apple again. Chris purchased his first Mac at the Palo Alto Apple store in 2002, when Steve Jobs popped in for an unexpected visit. He rushed to introduce himself to Steve, who responded with a quick sales pitch for Apple's (then) new SuperDrive. In 2004, Steve Wozniak keynoted Chris' annual conference (www.gnomedex.com). In 2007, Chris finally made the switch away from Microsoft Windows. You can find Chris blogging and regularly recording videos about technology at chris.pirillo.com.*

by Pete Loshin

# OpenID: What It Is & Why It Matters

Have you heard about OpenID? It's the latest in a long line of Internet identity schemes, but unlike so many of its predecessors, it could actually have a future. It's at least notionally an Internet protocol. (It defines interactions between Internet nodes.) I have close to 20 years of experience in deciphering protocols, so here's my take on it.

According to the OpenID Web site (openid.net), "OpenID is a free and easy way to use a single digital identity across the Internet." This is almost the holy grail of Internet interaction. Remember "On the Internet, no one knows you're a dog"? Well, OpenID may not reveal your dog-hood, but it does let you build consistent identities that persist across time and Web sites. See OpenID's Web site for full details of how the protocol works; it's not too complicated, but it is too complicated to explain in a paragraph.

You can use your OpenID to blog and contribute to other people's blogs so that everyone can be pretty sure comments made on any OpenID-enabled blog by "scoobydoo.example.com" were all made by the same person. What's more, if you are "scoobydoo.example.com," you don't need to create a new username/password every time you want to participate on a new OpenID-enabled Web site.

People have been working on the single sign-on problem for a long time, with solutions like Kerberos (www.kerberos.org) coming out of work done at MIT in the '80s. But it's not an easy problem for a lot of reasons. Some solutions have been limited in being proprietary, others by trying to do too much or too little. OpenID hits the sweet spot for a new protocol, and I'm going out on a limb to declare it the next hot thing.

For starters, it's totally open. The people behind it know the value of open specifications. They know the importance of getting buy-in from everyone, and they're *not* pushing it as a way to generate proprietary profits. In fact, Brad Fitzpatrick, "father of OpenID," declares: "Nobody should own this. Nobody's planning on making any money from this. The goal is to release every part of this under the most liberal licenses possible, so there's no money or licensing or registering required to play."

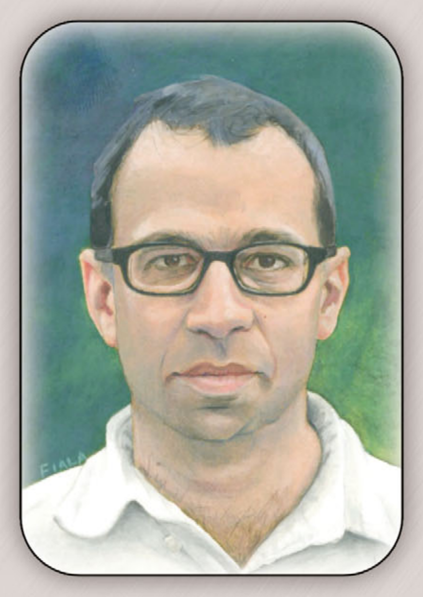
It's simple for users. Simon Willison, in his "How to use OpenID" screencast (tinyurl.com/26xpuz), says, "OpenID is a way of signing in to many different sites without creating a separate user ID and password for each one." Who wouldn't want this simplicity?

It's simple for implementers. OpenID uses mature technologies: It's a basic client/server protocol using HTML, URI (the spec for creating URLs), and cryptography (SSL and Diffie-Hellman key exchange). There's nothing scary or special or new about any of it, and we've done it a million times already. It's completely open: Anyone can write their own implementation, and anyone can use one of those implementations to run their own OpenID provider service, so you're not locked into any software or service. Just to make sure there are easy answers for deployers, the OpenID Foundation ponied up $50,000 (iwantmyopenid.org/bounty) from corporate sponsors for OpenID developers—$5,000 going to the first 10 projects to meet the bounty program's criteria.

Widespread industry and user support. Scott Kveton, an OpenID Foundation board member, claims over 120 million OpenIDs exist as of July 2007. You can use OpenID on Six Apart, Technorati, AOL, LiveJournal, WordPress, and many others, or you can go to a provider like MyOpenID.com or VerisignLabs.com.

Microsoft will support OpenID. That's no guarantee it will succeed, because Microsoft has supported a lot of stuff that never went anywhere. But it's still a prerequisite for any up-and-coming computer technology.

The real kicker? It's controversial. Almost everything I've read about OpenID points to a raft of opponents who claim "it doesn't do anything useful, and it's potentially dangerous." OpenID isn't perfect, but it is getting a lot of attention. All those naysayers wouldn't bother to point out flaws in a protocol they don't expect to be going places. ▲



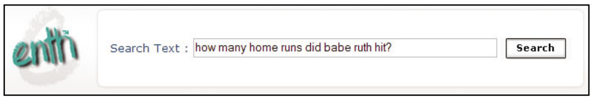
*Pete Loshin publishes LinuxCookbook.com, a place to learn even more about Linux. And don't forget to check out the new Ninitata.com, Pete's family-friendly fun and learning site.*

**You can get saucy with Pete at pete@cpumag.com.**

# The Web's Deep Treasures

## Exposing The Invisible Internet

Type any common combination of keywords into a general search engine, and most of us get more results than we want, let alone use. The increased reach of search spiders and the gushers of new content pouring online make the online world seem awash in material—pages of results we never even read. Could there possibly be more there than meets the eye? Although no one has a firm grasp on how much data really exists on the Internet, let alone how much of it Google or Yahoo! indexes, many industry insiders claim that only 1% of the Web is visible to search engines, while the rest is "invisible." Alternately called deep Web, hidden Web, and invisible Web, this massive expanse of data is defined by its inaccessibility to standard search engines, which are said to trawl only the surface Web. For all their power and apparent exhaustiveness, Google and Yahoo! leave 400 to 550 times the amount of data they find unsearched, according to the last major study in the *Journal of Electronic Publishing* in 2001 (although an older study, this study remains the one people in the industry turn to when discussing the deep Web).



Search Text : how many home runs did babe ruth hit?

**A simple example of surfacing deep Web material is the way Enth converts a simple question about Babe Ruth's career home run statistics into a database query.**

What is this deep Web? Primarily it's made up of databases that a search crawler cannot access either because of technical limitations or because the content sits behind firewalls and password-protected areas that the holders deliberately keep out of a search engine's sight. Government databases, medical and academic journals, personal records, professional publications, and proprietary research reports all usually exist beyond Google's radar because that is the way the owners want it. Massive repositories such as Lexis/Nexis and many library holdings have to respect the copyrights and business models of the original owners. In many other cases, however, the information beneath the surface Web simply exists in formats that confuse a standard search spider. In his 2001 *JEP* article, Michael Bergman, vice president of search firm BrightPlanet, proposed that the surface Web has about 19 terabytes of information compared to 7,500 terabytes of deep Web data. "On average, deep Web sites receive 50% greater monthly traffic than surface sites and are more highly linked to than surface sites," said Bergman. "However, the typical deep Web site is not well-known to the Internet-searching public."

The deep Web is invisible to search engines in two ways that are relevant to the fundamentals of engine design. General search analyzes keywords on a page. Search engines are examining HTML pages for instances of the search term. The engine also calculates the number of links coming into the page from other sites and applies algorithms to determine its relevance to a search. To do all of this as well as they do, Google, Yahoo!, and MSN need static URLs that they can index and retrieve on a regular basis. Because of this limitation, engines usually get stymied by dynamically served content such as the results of a database search. Most databases do produce a page of results that sit on a temporary URL, but that result is fleeting and cannot be indexed easily by a third party. "So the deep Web is content that is theoretically accessible to a selected audience but is restricted in either deliberate or technical means," says C. David Seuss, CEO, Northern Light, which mines the deep Web for corporate clients. "If it is not showing up in search indexes, that makes it 'invisible,' because if it is not in a search index, it may as well not exist from the viewpoint of the general public." Even more to the point, most of the databases on the Internet sit behind subscription walls. Search engines are smart, but generally they are not smart enough to crack unknown logins and passwords.

There are very deep databases that are fully accessible to everyday searchers that ordinarily don't register in a Google or Yahoo! results page. Many directory sites that include phone numbers, weather information, flight schedules, prices, Q&A

## Not Your Kid's Internet

Northern Light (www.northernlight.com) has been drilling the deep Web since before it had that name. Over the last decade, it has created specialized search engines for some of the largest companies in the United States. CEO C. David Seuss tells us that the major search engines not only miss a lot of data on the Web, they miss the most valuable stuff.

**CPU: How do you get at the invisible Web?**
**Seuss:** We have relationships with 65 market research providers (Forrester, IDC, etc.) and we index their material in a variety of ways even though it is not available to crawlers. To index deep Web material, you have to have the active cooperation of the Web site. There really is no other solution.

**CPU: If much of this material is databased and dynamic, how do you access it?**
**Seuss:** Take a relational database. You index the views. The database owner can define a *view*. Databases are all [composed of] fields. A view pulls all of that as a list of records that make coherent sense, as if the fields were printed on a piece of paper—that might be a view. We would index the views. Relational databases will respond to a crawler ping with views if you organize it.

**CPU: How much data is on this invisible Web?**
**Seuss:** Quantity is the least interesting dimension because there is a gigantic amount of poor-quality content on the Web, and the general problem is not finding more stuff. The other dimension is quality. And the quality of the invisible Web is a thousand times higher than the quality of the visible Web. The quality of the market research you can get from a market research company is very different from the quality of the market research you can get off of the Web.

**CPU: A lot of people seem to assume that just about all important content is searchable on the Web.**
**Seuss:** The Web is fantastic for finding certain facts that people want you to know. If I want to get the phone number of the CVS pharmacy in Charlestown, Mass., the Web is a great way to do that. And the bigger the index (take Google), the more likely I am to find that fact. And the Web is the greatest distributor of news in the world. But if I want to see how Web 2.0 features will evolve over the next few years in enterprise software applications, the Web may be the worst possible place to go for that information. It's filled with so much duplication, so much low quality, so much content from sources of dubious parentage and purpose. What I should do if this is important to my employer is go to authoritative industry analysts who are talking to the companies who are producing the solution. If people believe the Web holds all information, they are wrong. If they think the Web holds all quality information, then they are dangerously wrong.

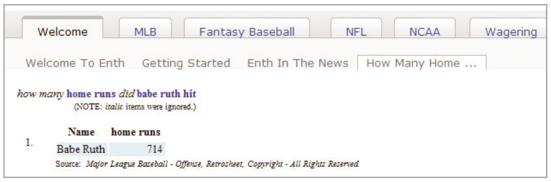
stocks, and patent information are inside databases that are open to anyone who comes to the site to make specific queries. But their dynamic structure thwarts standard attempts to search them from a portal. The U.S. government's National Center for Biotechnology Information (www.ncbi.nlm.nih.gov) includes the GenBank database of DNA sequences that scientists have discovered and the dbGAP database of Genotype and Phenotype data. Much of this material is run as a database search and so it does not surface in a typical general search engine query.

Or try the National Library of Medicine site (www.nlm.nih.gov), where you can enter many of the same health terms you can at a popular health information portal and get back reams of high-quality medical data sponsored by the U.S. government. Again, because of the structure of this material, much of it does not come up in a search engine.

### Monetizing The Deep Web

Much of the deep Web resides in proprietary repositories and in a database format, and there is tremendous value locked away in this material. And so the race is on among deep Web search companies to mine this data. Companies such as Northern Light, CloserLook, and BrightPlanet are devising approaches to exploring the deep Web more effectively, especially for business clients.

"We realized early on that search engines were good at searching home pages and static pages, but databases were being ignored," says Sumithra Jagannath, president and founder, CloserLook. "I was working in the credit and collection field to help debt collectors uncover information on people, and a lot of this content was on the Web. That is where we got the idea."



*how many* home runs *did* babe ruth hit
(NOTE: *italic* items were ignored.)

| | Name | home runs |
|---|---|---|
| 1. | Babe Ruth | 714 |

Source: *Major League Baseball - Offense, Retrosheet, Copyright - All Rights Reserved.*

Deep Web company BrightPlanet offers a database of databases, this CompletePlanet guide to the kinds of content that most search engines cannot penetrate.

Now, CloserLook makes a business of creating custom deep Web applications for companies such as a toy manufacturer that wants to track how its product is being distributed among many online e-retailers. By running search queries through a predefined group of databases, CloserLook is able to create for the client a view on how its product is doing. "They can see if toys are in stock, changing prices at Wal-Mart or Sears, or if they are out of stock so the manufacturer can get an idea whether to contact the store," says Jagannath. "What we are looking for is very particular information. Otherwise, it's just noise."

Closer Look™
Search solutions for the Invisible Web
Health
City Guide
Canada Airfares
Type in a health topic such as diabetes, prednisone
Search
Hints on how to use the health search »
Licensing | Vertical Search Solutions | Invisible Web | Website Design

Companies such as CloserLook offer deep Web searches of select databases like health resources as demos for consumers, but the main part of the deep Web business serves business intelligence to the enterprise.

CloserLook also provides a public deep Web search of health resources (at www.closerlooksearch.com). The engine searches only a defined set of 15 health information databases and delivers the results of a query such as "heart disease" in a more organized way than a results page. You get a definition, links to hotlines for calling services, images, news, treatments, and links to additional articles, all packaged and categorized in ways that Google or Yahoo! only dream about. This is possible because a deep Web search of predefined materials can be categorized accurately, because unlike a general Web search, this engine knows exactly the kind of information it's mining from its select sources.

## Deep & Cluttered

The information in the deep Web is considered so valuable that competition is fierce for finding ways of accessing and packaging it for clients. CloserLook aggregates database queries, for instance. NorthernLight (see sidebar) partners with many proprietary sources to create "views" into their data for easier crawling. BrightPlanet (www.brightplanet.com) uses an engine that runs multiple queries across data sources and then monitors changes and disparities among the results, a process it calls "differencing." For business users, this technology purports not only to search information but track changes. Many clients for deep Web services are companies that want to monitor the competition and get business intelligence about how their rivals' strategies are changing.

Drilling the deep Web also creates the usual assortment of dotcom business debacles. One seemingly hot property in Silicon Valley, named Dipsie, actually crashed and burned before it came out of beta. The site proposed to have companies pay Dipsie to crawl their dynamically generated sites with a specialized spider and then put the data in a form that search engines could find. The site launched in beta and then closed several months later.

## The Deep Web & You

Because of its business value, most of the larger companies involved in the deep Web are aimed at enterprise users. But the ongoing attempt to illuminate the depths of Internet's unsurfaced content is beginning to reach general users. Newer "vertical search engines" include companies such as Farecast (www.farecast.com), which predicts when fares for specific airline tickets will go up or down. In order to monitor the pricing of specific flights, the engine doesn't search in a Google-like fashion so much as run precise searches against a wide but defined range of airline databases. The new search engine Enth.com turns English-language queries like "How many home runs did Babe Ruth hit?" into a database query that delivers a real result (that would be 714 homers) rather than a link to page that might have the answer. That engine is very focused on sports data for now and is already powering the search boxes at fantasy sports leagues. At CompletePlanet (powered by BrightPlanet), you can find an index of more than 70,000 databases and vertical search engines, many of which plumb the deep Web.

Will the deep Web ever come to your friendly, everyday search engine? In some sense, it already has, as Google and Yahoo! have programs and partnerships that give their engines access to select databases. In 2004, for instance, Yahoo! partnered with the Library of Congress and others to help ensure that it indexed previously invisible content. But CloserLook's Jaggannath is skeptical that a major general engine could ever master all of the fields of knowledge necessary to make deep searches of highly specialized material viable at a general portal.

"On a search engine, you only get links and have to do the digging yourself. We do deep Web queries into the databases underlying the sources. [Search engines] would still have to go to every link and decide if it is relevant. You need an understanding of the content." And that is something that most search engines do not have in their robotic brains, a way of understanding the meaning behind the links and how that information should be organized and prioritized for an informed researcher. Which may be why experts call that 1% of data that engines do access the surface Web. CPU

**by Steve Smith**

## Infinite Loop

### Binary Time

We can't think of a better way to display your love of binary code than to wear it on your wrist. You can do just that with the LED Binary Watch available at thinkgeek.com. The row of four LEDs at the top of the watch represents the hours of the day, and the row at the bottom represents the minutes. (You just have to add the numbers that are lit up to determine the hour and the minutes of the day.) You'll be thinking like a computer in no time.

www.thinkgeek.com/gadgets/watches/6a17/

by Rob “CmdrTaco” Malda

# badapps.txt

In the last few years, the rise of AJAX applications has transformed the Web from a passive medium filled with page after page of mostly unchanging content into a truly interactive platform. In fact, now we are finally seeing that Web pages are viable alternatives for many types of applications. Now I’m not suggesting that you should switch your CAD or image-editing tasks to an AJAX application, but a number of companies are proving time and again that things such as e-mail, RSS, and even spreadsheets and word processing are valid tasks to be handled within your browser.

Tragically, this causes a number of problems from the desktop perspective. From application switching to file management, we’ve spent years refining desktop operating system design.

Shortcuts such as using a keystroke to cycle through your active applications are second nature. Navigating through a file system to find that spreadsheet or document you need is efficient and elegant. Organization is simple.

But when you make the transition to a Web browser as your primary interface to applications, you create problems. Take this column, for example: Is it on my Desktop, on my local hard drive, or is it a Google Doc? The former requires navigation through the finder. The latter requires me to go to a bookmark and navigate a large list of files. It’s clumsy and not very well integrated with the rest of my system.

Likewise, if you (like me) use a mix of applications within your Desktop and your browser, you’ll find that your application selection process often requires two steps: First, activating your browser; second, then finding the tab or window that contains the program you need.

It’s not impossible. It’s just a serious pain. And it’s a huge obstruction if you want to explain this usage to a computer-illiterate family member.

There are a number of possible ways to simplify this. One would be for Google to use technology such as WebDAV to export a file system that contains your documents. Apple has done a lot of work over the years with .Mac to really make a portable shared file system easy, but in this age of always-connected computers, it’s quite reasonable to consider a DAV folder. All the major operating systems support it. You might need a wrapper launcher application to ensure that .DOC or .XLS opens the right files in the right system, but it shouldn’t be tremendously difficult.

This serves a dual purpose. For some types of data, such as your spreadsheet, you may occasionally need to open those files in a different application. I mean, Google Spreadsheets are nice, but it’s not like it has the same graphing and processing power of Excel. But more importantly, it would help to provide users with a single place for their data. I have dozens of documents saved as bookmarks in my browser and dozens more in elaborate hierarchies on my hard drive.

*Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the ’Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.*

Much harder is the application switching problem. There are a number of ways to kludge the problem. For example, you can configure Firefox to use profiles with specific settings. If you use Web email, you may not need the toolbar. A well-behaved application should not require a back arrow and URL bar, of course. The problem with this tactic is that when an email contains a URL, you click it, and you open it within your “Mail” profile. You may not need a back arrow on your mail client, but you sure will on that external page.

The problem shouldn’t be that hard to solve. A browser should know that a URL is a standalone application, and it should need to be treated in a special way. Surely this problem is common enough that it’s worth the effort. And getting to the point where the user doesn’t need to care if their application is a Web page or a local executable can only be a win for the noobie.

And anything that wins for the noobie will help you and I keep our Inboxes just a little freer of questions. ▲

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**Contact me at malda@cpumag.com**

# ROAD Warrior

by Jen Edwards

## Palm Expands Its Smartphone Line With Centro

The latest handheld from Palm is the Centro, a smartphone that will soon be available to Sprint customers. The Centro measures 4.22 x 2.11 x 0.73 inches (HxWxD) and runs Palm OS 5.4.9 with Bluetooth 1.2. Features include a 320 x 320 touchscreen display, 64MB of RAM, and a 1.3MP camera with 2X digital zoom and video capture.

A microSD slot supports cards as large as 4GB. A headphone jack, microphone, and multiconnector are located at the bottom of the device, and a QWERTY keyboard for messaging and text entry sits just below the four application hotkeys and 5-way navigator. The removable 1,150 Li-Ion battery lasts for 3.5 hours of talk time and up to 300 hours on standby.

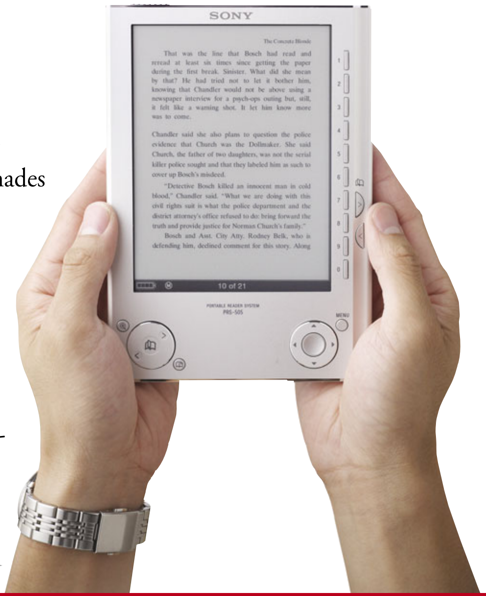
Preloaded software includes PocketTunes Deluxe, Documents to Go Version 10, Google Mobile Maps, Blazer 4.5 (Web browser), Nuance voice control, and Sprint TV. And although the Centro is aimed at consumers, business customers will appreciate the Centro's support for Microsoft Direct Push Technology for Outlook email. (Of course, this requires adding a Sprint data plan.) The Centro will initially be available for $399. (*NOTE*: *For a full review of the Centro, turn to page 26.*) ▲

**The Palm Centro smartphone is aimed at consumers but has many of the features business users need.**

## Updated Sony Reader Improves The Mobile Reading Experience

The new Sony Reader (model PRS-505; $299.99) has an enhanced screen with faster response and higher contrast to make it readable even in direct sunlight, with eight shades of gray and a choice of three sizes of text. The controls have also been redesigned to offer easier navigation. The improved Sony Reader now doubles as a USB storage device to directly transfer reading material (in addition to other data), as well as set up file folder synchronization for automatic transfers when you connect it to a computer. A single battery charge powers the device for up to 7,500 page turns, and the internal memory can store as many as 160 eBooks, with Memory Stick Pro Duo and SD card slots providing the option for additional storage.

The base package includes the PRS-505, a USB cable, desktop software, and a protective screen cover. Optional accessories include an AC adapter and colored leather covers. ▲



**The updated Sony Reader has a more readable screen and improved desktop software.**

## Mozilla Beefs Up Support For Mobile Devices

Mozilla staffer Mike Schroepfer recently indicated in his blog that Mozilla has launched a new initiative to extend the full Firefox experience to mobile devices, including the ability to run Firefox extensions and create custom applications with XUL (XML User Interface Language). Among the reasons Schroepfer cited are the emergence of powerful handheld devices (such as the Apple iPhone) with enough processing power and memory capacity necessary for the above features and increasing cries from users for a mobile Web experience comparable to desktop browsing.

Specific platform support has not yet been announced, but the full release of Mobile Firefox isn't expected to be available before 2008. Schroepfer added that while the Mozilla team is busy getting Mobile Firefox ready for prime time, development on Minimo has halted. The project wasn't a total bust, however: Mozilla developers gleaned plenty of useful information about how Gecko, Mozilla's layout engine, operates at the mobile level. ▲

## Garmin Brings Mobile Mapping To The Masses

Garmin Mobile XT ($99.99) is an all-in-one product that lets users quickly and easily add mapping functionality to their GPS-equipped mobile phones. The application, delivered on a microSD card (Garmin includes miniSD and SD adapters), includes maps for the United States, Canada, and Puerto Rico (a European version is also available), along with millions of points of interest and voice-guided turn-by-turn directions with automatic rerouting if a turn is missed.

The Garmin Mobile XT also integrates with the phone's address book and calendar on supported platforms. Peerpoints lets users broadcast their exact location to other Garmin Mobile XT users and also see the locations of family and friends, although using this feature is optional. The Garmin Mobile XT doesn't require a subscription fee and includes access to Garmin Mobile for weather forecasts, construction updates, and hotel information on data-capable smartphones.

Plug the Garmin Mobile XT into your GPS-equipped mobile phone for instant mapping and directions without subscription fees.

## Pinnacle, ReplayTV Bring HD Recording To Your Laptop

Mobile entertainment options are rapidly expanding, and two of the latest aim to make it even more accessible. Pinnacle Systems recently announced the Pinnacle PCTV HD Ultimate Stick ($129.99), which plugs directly into a USB port and records up to two hours of standard analog programming directly to the included flash memory. (Using your system's hard drive for storing HD programming is advisable.) There is no software to install to the user's laptop, and the device can also send recordings to a hard drive in a variety of formats, such as MPEG-2, MPEG-4, and DivX. Or, you can choose to send recorded programs directly to your DVD burner. The PCTV HD Ultimate Stick includes a telescopic antenna, remote control, and basic video-editing software.

ReplayTV's Personal HD is designed to make it easier for users to capture and transfer broadcast content to their iPod, iPhone, and other portable media devices. (They can also stream content over an Apple TV.) The $99 package includes a USB 2.0 ATSC/NTSC tuner, an HD antenna, a remote control (which can be stored in a PCMCIA slot when not in use), a USB cable, software, and a one-year subscription to the ReplayTV Electronic Program Guide. (Continued subscription is $19.95 per year thereafter.) A separate power adapter isn't required, as the tuner is USB-powered.

Features include an on-screen interface with search and grouping by show and the ability to personalize the guide with your favorite channels and shows. ▲

## Car Stereo + USB (Or SD) = Plenty Of Music For The Road

The new car stereos from Blaupunkt can deliver your tunes from a flash drive or SD/MMC card.

Blaupunkt (www.blaupunkt.com/us) recently announced two car stereos that have a surprising new feature in addition to now-standard abilities such as Bluetooth and MP3 CD capability: a rear-panel USB input that lets owners easily add their own hard drive to complement traditional CDs. The required cable ships with the system, and the USB input is behind the removable flip-up faceplate.

The MP57 ($319.95) has integrated Bluetooth and a black-and-white backlit three-line display that is also able to display JPEG photos stored on a connected hard drive. The MP47 ($209.95) has a Variocolour display and can be upgraded to include Bluetooth functionality with an optional add-on module ($229.95). Both models are also compatible with Blaupunkt's iPod input module.

For a less expensive alternative, consider Blaupunkt's Melbourne SD27 ($159.95). Instead of a CD player, the radio has an SD/MMC card slot that recognizes cards up to 2GB and plays MP3s and WMAs. A 30-character display shows the ID3 information for each song, and the unit also features an input jack compatible with virtually any portable music player's headphone or auxiliary-out jack. Like the MP47, the Melbourne SD27 is also compatible with Blaupunkt's optional iPod and Bluetooth modules. ▲

# At Your Leisure

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest and most interesting releases in PC entertainment, consoles, DVDs, CDs, and just leisure and lifestyle stuff we (for the most part) love and recommend, read on.

## Audio Video Corner

by Blaine A. Flamig

$13.98
Roc-a-Fella Records
www.jay-z.com

### Jay-Z—"American Gangster"

When Jay-Z retired from making records after 2003's "The Black Album," few fans thought he was done forever. Sure enough, he returned in 2006 with "Kingdom Come," a surprisingly lackluster musical and lyrical effort that left many wondering if Hova had lost his lyrical deftness. With "American Gangster," he proves he hasn't. Though the record stalls in a few spots, it mostly soars, fueled on huge doses of 1970s-era soul. Reportedly, Jay-Z wrote "American Gangster" after viewing a prerelease cut of Ridley Scott's big-screen "American Gangster," which tells the story of 1970s New York City drug lord Frank Lucas. Knowing Jay-Z's own hustler-to-CEO story, it's not difficult to recognize the Brooklyn native's deep commitment to and identification with the movie's subject matter. Welcome back, J.

$15.98
XL Recordings
www.hvarf-heim.com

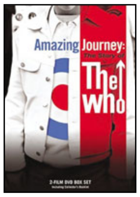
### Sigur Ros—"Hvarf/Heim"

There's good news and bad news saddled to Sigur Ros' two-disc "Hvarf/Heim." Positively, the live-acoustic, previously unreleased, and completely revamped originals on the discs are as wonderfully ethereal and mesmerizing as anything the Reykjavik, Iceland, natives have put forth in previous outings. Of the two discs, "Heim's" (which translates to "home") live renditions of previous recordings are arguably more interesting. Negatively, the nature of "Hvarf/Heim" doesn't result in much of a departure from Sigur Ros' previous work; long-time fans will largely miss out on the discovery process that typically comes with a new Sigur Ros album. Other than a few older, previously unreleased songs on "Hvarf" ("disappeared"), there's little adventure here. Still, even reworked songs from Sigur Ros are new gifts.

$23.98
Disney/Pixar
www.ratatouille.com

### Ratatouille

Brad Bird isn't a household name, but he should be. The director's family-friendly "The Incredibles" and "The Iron Giant" rank as two of the best animated flicks ever. Bird's excellent "Ratatouille" ranks only slightly behind. Intelligent, funny, and graphically delicious, "Ratatouille" tells the story of Remy (voiced by Patton Oswald), a rat living in Paris who aspires to be a master of French cuisine. Guided by the spirit of Chef Auguste Gusteau (Brad Garrett), Remy secretly pairs with low-ranking "garbage boy" Linguini (Lou Romano) to live the dream in the evil Skinner's (Ian Holm) kitchen. Although its cooking themes may not register fully with younger children, the movie's charm certainly will.



$29.98
Universal Studios
www.thewho.com

### Amazing Journey: The Story Of The Who

Among British rock royalty, The Who has always been seated behind The Beatles and The Rolling Stones. Where rock documentaries are concerned, "Amazing Journey: The Story Of The Who" need not take a back seat to anything before it. Intimate, touching, informative, and thoroughly introspective, "Amazing Journey" brilliantly goes off the beaten path most rock docs follow to tell the 40-plus-year story of The Who through new interviews with Townshend, Daltrey, current and former managers, spouses, children, Sting, Eddie Vedder, The Edge, Noel Gallagher, and many others. Boasting exceptional surround sound, tons of exclusive concert footage, and scads of bonus material, "Amazing Journey" is an aptly titled masterpiece.

See the full reviews from A/V Corner at www.cpumag.com/cpujan08/AYL

## DVD Byte

**12/4**

24: Season Six

Pirates Of The Caribbean: At World's End

Superbad

**12/11**

The Bourne Ultimatum

Bugs!

Harry Potter And The Order Of The Phoenix

**12/18**

Balls Of Fury

Halloween

The Simpsons Movie

**12/26**

Eastern Promises

Rush Hour 3

# The Orange Box

Game Of The Month

## Game Pride Parade *-by Dr. Malaporop*

$49.95 (PC); $59.99 (360, PS3) • ESRB: (M)ature • Valve • orange.half-life2.com

The Orange Box contains enough gameplay to condition gamers to believe that the color orange is cool. The PC version has visually been improved in the past few years, but the 360 version of HL2 narrows the gap substantially and is actually more immersive with a large HDTV and 5.1 audio. The upcoming PS3 version is being ported by EA. We also list the price for each game if you purchase it à la carte on Steampowered.com.

**Portal** ($19.95). The Orange Box jewel, Portal is the game you *need* to try even if you aren't an FPS fan. Unlike the other games, Portal is an FPS puzzle with a great concept that we first saw in Prey and only hope to see used in the upcoming HL games. Your female protagonist wakes up in a room at the Aperture Science Laboratories to the best computer AI voice since HAL 9000 ("2001: A Space Odyssey") and WOPR ("WarGames"). Your AI guide will stay with you through the 19 levels and helps maintain an excellent atmosphere. Turns out you're a lab rat brought in to test a new technology with a gun that shoots portals. For example, your gun can create entry and exit portals that you use to solve puzzles through each level. The skill level climbs gradually and does an excellent job of teaching the concepts that will be necessary to complete the game. Sit through the credits for a great tune and a little surprise. Completion time is estimated at up to five hours.

**Half-Life 2** ($19.95). HL2 debuted on the PC in late 2004 and continued exactly where HL left off. Valve has worked to improve the game engine visuals over the years, but while it looks good, it seems nearly ready for an overhaul. We like that PC gamers who already own HL2 can gift the bundled Orange Box version to friends. Completion is estimated at 20 hours.

**Half-Life 2: Episode 1** ($9.95). After completing 20 hours in HL2, it's disappointing to have to spend so much more time in the Citadel and City 17 environments without new weapons. This is arguably the weakest game in this package, which is ironic because it manages to still entertain. Alyx Vance's character is strengthened through the game, and you'll be quite attached to her by the end. Completion is estimated at five hours.

**Half-Life 2: Episode 2** ($29.95). This is an all-new episode to the package, and thus we can't say much without revealing spoilers. Early in the game, you're ambushed by a Hunter (a mini version of the Strider), which leaves Alyx in a dicey situation, and it's up to you save the day. The game's build-up to the woodland battle is intense, and the end-game leaves you wanting Episode 3 now. Completion is estimated at six hours.

**Team Fortress 2** ($29.95). It's been more than 10 years coming, but Team Fortress 2 is a standout title that will keep you playing this package for a long time. Immediately noticeable are unique visual looks to the characters and environments (think visuals from "The Incredibles" with tougher characters and some blood). The refreshing character design simultaneously charmed and caught us off-guard. Completion time is estimated in years as more maps become available.

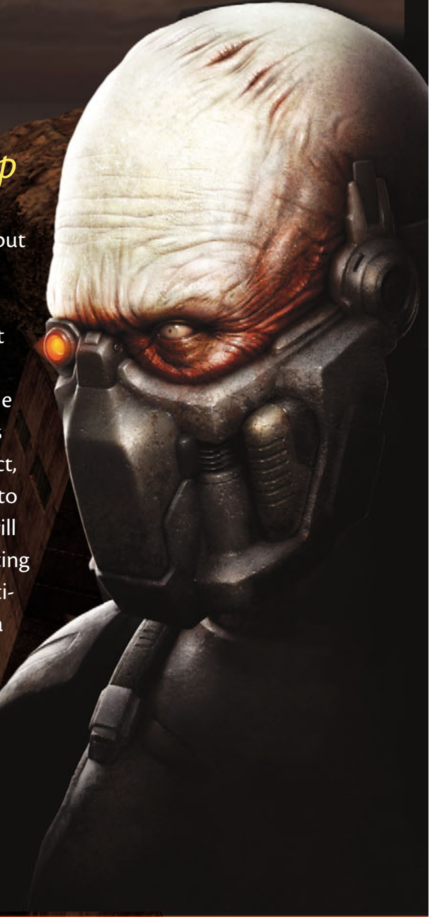
The single-player games felt equally solid on PC and 360, but TF2 was substantially more enjoyable on the PC with mouse/keyboard control. Be sure to check out the developer commentary that comes included with all but the first game in this package. The Orange Box is the video game steal of 2007, so miss it at your own risk. ▲

# ENEMY TERRITORY QUAKE WARS

$49.99 (PC) • ESRB: (M)ature

Activision • www.enemyterritory.com

## Battlefield Action In The Massive Outdoors – *by Dr. Malaprop*



The last multiplayer-only Quake game was Quake III Arena in late 1999. That iconic multiplayer release was all about deathmatches. However, a lot has changed since then. Enemy Territory: Quake Wars comes from Splash Damage, the developers behind 2003's popular and free Return to Castle Wolfenstein: Enemy Territory.

ET:QW is a tactical FPS in the same vein as EA's Battlefield series. The setting for this game is before the Quake series and has the Earth's GDF (Global Defense Force) going toe-to-toe with the Strogg. The objective-based gameplay is going to be immediately familiar to anyone that played RtCW:ET, but the developers have advanced the gameplay design to bring much more depth to the multiplayer mayhem. The in-game objectives are marked very clearly, so even novice gamers will know which way to head. The various classes are diverse, and you'll need to learn how to apply the right class to the environment/objective you're fighting over. Vehicles, like in Battlefield, can be challenging to learn but devastating when used properly. We just wish the weapons carried more "oomph."

The Quake engine continues to look good but won't make you slobber when compared against the latest engines from Epic and Crytek. The drab, brown color scheme makes levels feel repetitious when, in fact, they're not. The game is friendly to all levels of gamers, but players will require several hours before starting the gameplay love affair. Your ultimate joy will come with finding a team of regular players (ideally your friends) that you can play with to hone your craft in a way that's just not possible with random players. We started out feeling a bit iffy, but over a couple of weeks found it hard to tear ourselves away from the fulfilling gameplay—oftentimes overlooking Team Fortress 2 to get more hours in ET: QW. ▲

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# PGR4 PROJECT GOTHAM RACING

## Wet, Icy, Wild Exotics

### -by Dr. Malaprop

$59.99 (360) • ESRB: (E)veryone

Microsoft • xbox.com/projectgothamracing4

Project Gotham Racing 4 comes from the opposite side of the Forza Motorsports 2 fence. It has arcade stylings with a heavier simulation bent than the typical arcade racer, which is more suited for the mass audience. The kudo system (points for driving with style) is back and now lets you buy in-game items, which is a nice touch.

The significant updates to PGR4 are the visually stunning weather effects, the addition of motorcycles, and a career mode. The weather effects are among the best we've seen in a game and affect the physics of whatever you happen to be driving at the time. (It's not often we take our Ferrari for a spin in snowy weather.) Motorcycles are fun, especially when pitted against cars in online multiplayer matches, but ultimately not as robust in play as the cars. Last but not least, the career mode goes from September to December. It's the deepest yet, but in an act of design travesty, you will not be able to replay events because your career continues even if you don't want to.

PGR4 feels like it should have been PGR 3.5, which is not meant to divert you from buying the game. The overall product is evolutionary with rock-solid gameplay and visuals, and that's light criticism for a good game. ▲

GUITAR HERO III LEGENDS of ROCK

## Unleash Your Inner Rock Star *-by Dr. Malaprop*

With Guitar: $79.99 (PC); $89.99 (Wii, PS2); $99.99 (360, PS3)

Game Only: $49.99 (PS2); $59.99 (360)

ESRB: (T)een • Activision

guitarherogame.com/gh3

www.aspyr.com/product/info/85

Throw out your anxiety, because Guitar Hero III is everything you'd expect in a sequel and then some. About half of the main set list consists of tracks performed by original artists, which beats imitations. It's the varied mix of classic and modern songs that's the star of this gig. (See the Web site for a full track list.) This time, the bundled guitar is a toy-like Les Paul. The 360 guitar is wireless for the first time, the Wii guitar has a slot to hold the Wiimote, and the PS3 version ships with a USB dongle, as it doesn't utilize Bluetooth. Gameplay is pretty similar to GH2 (see our review in the June 2007 issue), but adds a few new modes, including a battle mode that's better in concept than practice. The PC version of the game, released by Aspyr Media, only includes a wired controller in the bundle, but overall plays as well as the console ports.

We love GH3's tracklist, improved feel of the new bundled wireless guitars, and online play. (Why no co-op campaign?) The repetitive in-game brand advertising feels out of place and didn't sit well, but that criticism aside, shredding is everything you want it to be in Guitar Hero III. Just be prepared to rock out a little harder; GHIII is more challenging than Guitar Hero II. ▲

## CLIVE BARKER'S JERICHO™

## On The Cusp Of Greatness *-by Chris Trumble*

$39.99 (PC); $59.99 (X360, PS3) • ESRB: (M)ature

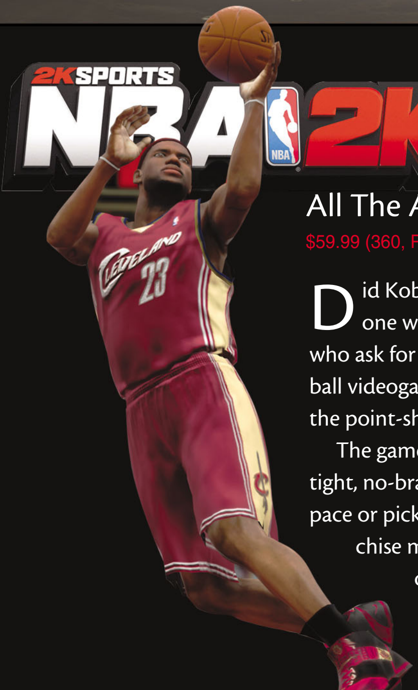
Codemasters • www.codemasters.com/Jericho

The console and PC game markets are flooded with great FPSes right now, so it would be easy for Jericho to slip under the radar. It would be a shame for some of you to miss out on this game, though, despite its considerable flaws.

Jericho is a horror-themed shooter stretched over the framework of a dark, cool story by Clive Barker. It follows the exploits of a special paramilitary unit called Jericho that specializes in supernatural warfare. When an ancient evil crops up in the desert, Jericho is sent in to save mankind.

The game looks and sounds great, aside from some repetition in enemy models and the inexplicably silly voice (*seriously!*) that introduces the story's premise during the intro. And although gameplay and the story both come up a bit short in the long run, Jericho offers a pretty cool hook in that you can jump instantly from one character to the next and tap each team member's unique weapons and special abilities as needed.

Jericho feels like a game that could have been a contender for game of the year with more polish. As it is, the game is still deliciously macabre and provides a nice change of pace from the many cookie-cutter, tactical squad-based shooters lining the shelves. ▲



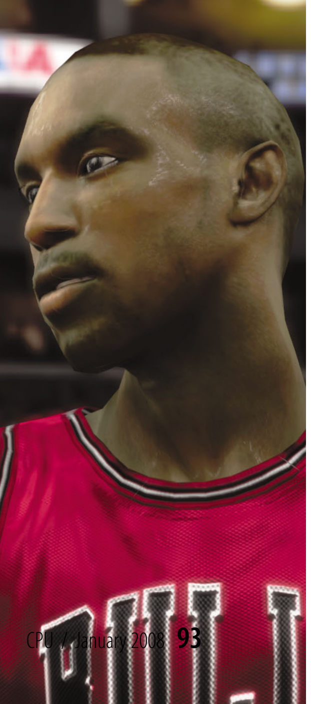
## 2K SPORTS NBA 2K8

## All The Action, None Of The Drama *-by Chris Trumble*

$59.99 (360, PS3); $29.99 (PS2) • ESRB: (E)veryone • 2K Sports • www.2ksports.com

Did Kobe clean out his locker, or didn't he? In NBA 2K8 from 2K Sports, it doesn't really matter one way or the other. Tired of acrimonious team-star breakups, front-office scandals, and stars who ask for time off to pursue music "careers"? NBA 2K8 is the most realistic, hard-charging basketball videogame ever made, and it delivers the best part of the NBA experience without the point-shaving refs.

The game's player models look and move with unprecedented, lifelike accuracy, and thanks to tight, no-brainer controls, you can push them up and down the court at a feverish run-and-gun pace or pick apart your opponents with deliberate precision as you see fit. A deep franchise mode, strong online play, and a rock-solid soundtrack round out 2K8's offerings and keep things interesting long after you've mastered the single-player experience. ▲

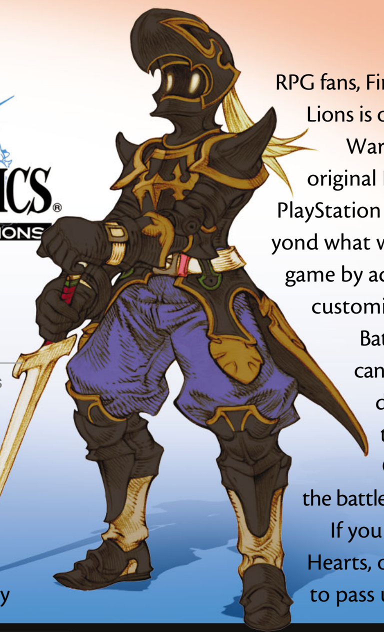


# FINAL FANTASY TACTICS
THE WAR OF THE LIONS

## A Handful Of Win
*-by Chris Trumble*

$39.99 (PSP) • ESRB: (T)een

Square Enix • na.square-enix.com/fftactics



We don't generally do a great deal of coverage of handheld games here in "At Your Leisure," but every now and then, a title comes along for a portable system that simply refuses to be ignored. For strategy RPG fans, Final Fantasy Tactics: The War of the Lions is one of those games.

War of the Lions is a PSP update of the original Final Fantasy Tactics release for the PlayStation in 1998 that goes above and beyond what was already a fun, incredibly deep game by adding engaging cel-shaded cinematics and a passel of new character customization options.

Battles take place on battlefield grids, complete with varying terrain that you can rotate, tilt, and zoom in and out of (although we'd have liked more freedom in this respect), and involve moving the members of your party where they can do the most strategic good according to their skills and weapons. Once you've completed a battle's objective (or you've been wiped out), the battle is over. If you've met your objectives, the story progresses.

If you enjoyed the original Shining Force games, Fire Emblem, Vandal Hearts, or Tactics Ogre, Final Fantasy Tactics: The War of the Lions is too good to pass up. ▲

# LEGO STAR WARS
THE COMPLETE SAGA

## The Whole Lego Enchilada *-by Chris Trumble*

$49.99 (360, PS3, Wii); $34.99 (NDS) * ESRB: (E)veryone 10+

LucasArts Entertainment • www.lucasarts.com

I have a confession to make. Yes, I love "Star Wars," but when I first heard the rumors regarding a Lego Star Wars game prior to the original game's launch back in 2005, I was pretty quick to dismiss the concept. After all, I'm a grownup now, and I play games with mature themes, sophisticated games that deal with weighty issues and stories. And besides, Legos are for kids, right?

I was, of course, quite mistaken. Not only do the games look, sound, and feel like "Star Wars," but starting with Lego Star Wars II, they also offer the ability to create cool hybrid characters by mixing and matching character body parts. Plus, the Lego element and these games' excellent sense of humor make them fun for adults and kids alike. The first game limited players to playing through scenarios drawn from Episodes I, II, and III, and the sequel gave players access to scenes from the original trilogy. As its name suggests, The Complete Saga lets you play through all six movies. You get access to scads more scenes, characters, and vehicles this time around, and TCS also incorporates online play in the PS3 and Xbox 360 versions. ▲

# Virtua Fighter 5™

## Arcade Beatdown Fave Comes Home
*-by Dr. Malaprop*

$59.99 (360, PS3) • ESRB: (T)een

Sega • www.sega.com/vf5

The PS3-only release of Sega's Virtua Fighter 5 was surrounded by quite a lot of hubbub when it joined the fray in early 2007. The subsequent Xbox 360 version has taken eight extra months to make it into stores, but it's worth the wait. VF5 for 360 features one significant new feature that will make fellow PS3 combatants green with envy: online play. Combats with players in other parts of the world typically felt like they were sitting right next to you, and the expected lag was mostly minimal. And bringing a customized fighter into online games is a nice touch.

Like the best fighting games, what may start out as a button-masher steadily turns into more strategic play as you learn new combos and the subtleties that make each character unique. The game controls very well with the standard 360 controller, and the left analog stick will be sufficient for many. However, VF veterans will likely opt for a third-party arcade-style controller, such as Hori's $60 Virtua Fighter V Xbox 360 Arcade Stick. Sega has struck an excellent balance in VF5 that makes it appealing to normal and hardcore fighters. The stunning graphics and excellent animation let this arcade fighter raise the genre bar. ▲

by Barry Brenesal

# The Floppy Disk

You young'uns. You think you have it so hard, waiting 30 seconds for a 500MB program to run! Why, 25 years ago, a little 64K chess game took 30 minutes to load because the Radio Shack TRS-80 Model 100 I used got its code into volatile memory via a cassette deck. The floppy drive may seem like the Model T Ford of computer storage today, but for those of us who cut our teeth on punched-hole media and linear-fed magnetic tapes, it felt like a bullet train to paradise.

Floppy diskettes were actually developed back in the late 1960s. IBM's System/370 mainframes stored code in read/write semiconductor memory so that when you turned power off and back on, you had to reload your programs. Tapes were just too slow to do the job. David Noble's team created a read-only 8-inch memory disk and enclosed it in a plastic sleeve after noting problems associated with surface dirt. It stored 80KB, which IBM boasted at the time was as much as 3,000 punch cards. Still, the limitations of a read-only storage device were obvious. When Noble's supervisor, Alan Shugart, left IBM for Memorex in 1972 (to be followed by more than 100 of his former employees), he was put in charge of designing the first read/write floppy drive. The floppies handled 256KB of data per diskette, a remarkable amount at the time.

It was natural for a form of this cutting-edge technology to migrate onto personal computers in the 1970s, but implementation was limited. Those floppy drives were expensive (more so in some cases than the computers they accompanied) and prone to mechanical difficulties, so cassette tape recorders became the external storage medium du jour.

Meanwhile, in 1973, the peripatetic Mr. Shugart struck out on his own and formed Shugart Associates. It was approached in 1976 by the brilliant inventor An Wang (co-founder of Wang Laboratories), who invited SA's co-founder and director of engineering, Don Massaro, and an associate engineer, Jim Adkisson, to Boston. There, in a typically dark bar, he voiced his request for something less bulky than the standard 8-inch floppy to use in his word-processing machines. What size diskette did he want? Wang indicated a cocktail napkin on the table. "About that size," he replied. Legend has it that Massaro and Adkisson dutifully flew back to California with the cocktail napkin, which they presented to their staff. That makes a good story, but whether true or not, the fact that the industry ended up with a 5.25-inch floppy does speak to the literal-mindedness of engineers.

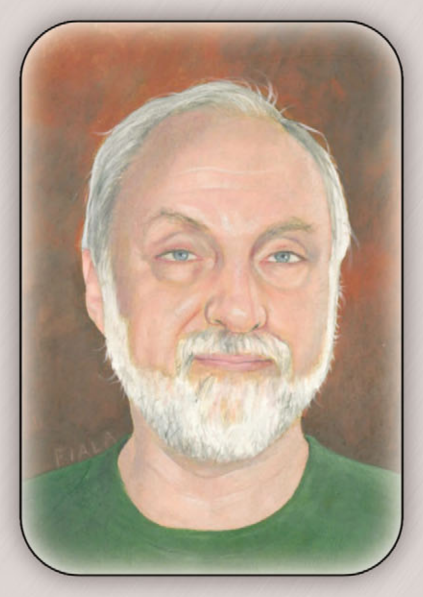
(In case you're wondering why Wang hadn't met with Shugart himself, it was because the latter had been forced out in 1975 by his original financial backers. But pity not Mr. Shugart. He started up Shugart Technology in 1979 to manufacture hard disk drives—a company better known today as Seagate Technology. Shugart changed the name to avoid confusion, just days before receiving a stiff legal letter from Xerox, who had purchased Shugart Associates and considered his name theirs.)

The cheap drives Shugart Associates developed for its new floppies proved so popular that the company was manufacturing more than 4,000 a day at one point, but 360KB storage from double-density 5.25-inch floppies eventually proved too limiting. Numerous attempts were made to create a new standard. The one that stuck was a double-density 3.5-inch disk produced by IBM in 1984, which could handle 720KB of data.

Three years later, IBM released the "high-density" version that stored a whopping 1.44MB.

Attempts by NeXT and IBM to later improve this model to 2.88MB in the early 1990s were too little, far too late. Other companies were already proposing new standards that supported 10 times the storage. The floppy had a few more years in the sun when Iomega released its popular 100MB Zip drive in 1994, but the coming of CD-ROMs and flash drives dealt the death blow to this noble storage device.

Shugart in turn died in 2006, but not before showing his disgust with the U.S. political system by promoting Ernest, his Bernese Mountain Dog, as a write-in candidate for the U.S. Congress. Until next month. ▲



*Barry Brenesal has written more than 1,000 published articles and reviews on electronic technology since 1987. His first personal computer was a Radio Shack TRS-80 model 100. It was last seen functioning as a boat anchor.*

**Wax nostalgic with Barry at barry@cpumag.com**

# Software Tips & Projects

## Moving Pictures

Veteran *CPU* magazine readers will recall that one of the earliest Software Tips columns blew the lid off one of Microsoft's best-kept secrets—Photo Story. This free downloadable tool for Windows jazzed up bland slideshows with narration, background music, and even some limited animation. But the best part of Photo Story is that it turned slideshows into movies that you could email or burn to disc. With a little effort, you could even convert those productions into DVDs so simple even the grandparents could use them.

Photo Story is still available for Windows XP, but we discovered that an even more powerful version of that program's core elements are hidden within Vista's Movie Maker program. Last issue we tinkered with a few basic visual tricks in turning still images into dynamic movies. This time, we channel Ken Burns.

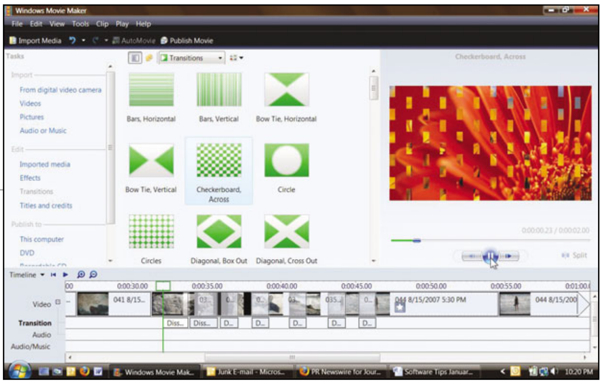
### Bringing Stills To Life

To review from last time, open Movie Maker and click the Storyboard item (bottom left of the screen) to switch into Timeline mode. This mode gives you more granular control over the images you load into our slide movie. Drag the Timeline pane up so you can see the Video, Audio/Music, and Title Overlay tracks. Then click the small + icon next to the Video track to expand Video Track and get the full view of what is available.

Now, use the Import Media button in the upper left of the screen to bring your still images into the media library. Next, just drag and drop the slides onto the Timeline in whatever general order you like. The program defaults to a five-second duration and a 4:3 aspect ratio for every slide, both of which you may want to change. Use the Tools/Options menu and go to the Advanced tab. Here you can change the duration for the slides and any transitions you drop in. If you are going to be showing this on a widescreen TV, set the 16:9 aspect ratio, as well. Remember that you can manually change the screen duration of any image or transition on the Timeline in the editing bay, as well.

### Passages

Movie Maker comes with a good selection of slide transitions, which you can see in the Edit/Transitions section of the left-hand menu. Drag and drop a transition onto the Timeline between any two slides and it will show up as a small block in the Transition track. If you want a more relaxed pace, you can lengthen the duration of the transition between slides by clicking this block and hovering the cursor toward the left. When the two-way red arrows appear, you can click and drag the left edge farther into the region of the first slide. A pop-up tag will indicate the duration, in seconds, you are adding or subtracting from the transition as you move it left or right. Because the size of the transition blocks can be so small, use the +



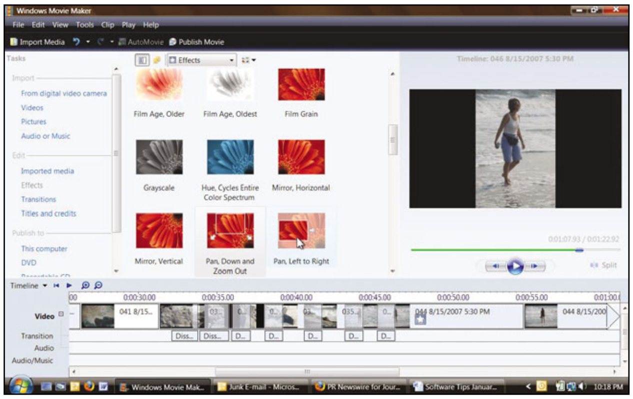
You can blend transitions between slides and the timing of the slides to create dramatic effects even with a series of static images.

### Vista Tip Of The Month

Digital photographers know that snapping pictures in RAW mode is the most pristine and least processed format. But unlike JPEG, RAW is implemented differently by each manufacturer. Nikon cameras produce their own "NEF" files, Sony "SRF" files, and Olympus "ORF." Generally, you can transfer them to your PC, but without the custom software from the manufacturer (or PhotoShop plug-ins), they are not readable in Windows. But with the much improved Vista Photo Gallery, all three of these manufacturers have issued codecs that let the OS recognize their RAW files for viewing. Import the files to Photo Gallery, try to open one, and the Gallery will check online to download the respective codec.

### Registry Tweak Of The Month

If you use the Run command box off the Start menu in Windows XP or Vista, then you are creating a history of these activities on a PC. Previous commands are available in the Run box on a drop-down menu. You may want to eliminate that history, however. This is done via the Registry key HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\RunMRU, where you will find the current history of your Run commands. In the Value pane, simply delete the values containing the commands you want to erase. Eliminate all the Values (leave the Default Value) and your Run command line will be clean.



Vista's new Movie Maker application lets you insert pan and zoom effects onto slides for shows that resemble PBS documentaries.

zoom button on the top of the Timeline to expand the view and make each element larger and easier to adjust manually.

Remember that in slides you can use a combination of transitions and slide durations artfully to improve the narrative flow of an image sequence. I might use the Dissolve transition to maintain greater visual continuity among similar images from the same setting rather than a Wipe or Flip. Even more effective is playing with the duration of the shots in a sequence for greater effect. For instance, I have a sequence of four images of active beach surf hitting rock formations, followed by two images of my daughter ankle deep in the sea foam staring into the waves. So in this case, I would highlight each of the rock and surf images and shorten their duration, perhaps to three seconds each. Highlight each clip, and when the two-way red arrows appear, drag to the left to decrease the duration. These rocks establish setting but aren't of interest or don't have significant impact in and of themselves. I put dissolves between the brief images. Then I dissolve into the final, most dramatic image of my daughter, but here I increase the standard duration from five seconds to seven or 10.

Try to establish the sequence of your slides and set the durations before applying transitions. Also, one of the best creative tools to use in a slideshow is a black slide. I simply go into Windows Paint program and fill a screen with black paint and save it to my Pictures Library. At the end of a dramatic sequence, I drop the black image at the end of the sequence, add a dissolve transition and let the final slide fade to black. This creates a visual punctuation before the next sequence.

## The Ken Burns Effect

One of the most compelling features in the original Photo Story tool was the zoom effect you could apply to static slides to give them the same animated appearance that Ken Burns made famous in his documentaries. Click the Effects item in the left-hand Edit menu to see previews of all the possible effects. Simply drag any of them onto the slide. Keep in mind that the zoom effect will last for the duration of the slide. If you lengthen the screen time of the image, the zoom will unfurl more slowly. You can overcome this limitation by putting two copies of the same image in sequence on the Timeline. Apply one of the Zoom Out effects to the first image and put no transition between them and no effect on the second instance of the image. The resulting effect will be a zoom out to the full image, which then remains static on-screen for any duration you choose.

## Fancy Language

Hidden deep within Movie Maker's trove of goodies is a set of titling tools that really livens up slideshows. In order to superimpose animated titles on a given slide, highlight that image on the Timeline. In the Edit area of the left menu, click Titles And Credits and then click Title On The Selected Clip. You can make one-line or two-line titles. With a one-line title, the words you type in the open box will appear as a single block on-screen.

If the text entry box only seems to offer you one block in which to type, click the Choose The Title Animation text button and click one of the choices under Titles, Two Lines. Click Edit The Title Text and you will return to the text entry window with two tiers for entering text. Click back to the Choose Title Animation button and highlight any of the choices to preview its effect in the main viewing window. When you make your choice and click Add Title, a new track appears in the timeline called Title Overlay. Click to highlight one of the Title blocks in the timeline. You can drag and drop it along that track so it starts whenever you like when the slide is on-screen. You can even drag the title beneath or between slides or drag one of the edges to extend or reduce its duration.

So now you have several types of animation at your disposal in a slideshow: transitions, zooms, and titles. We can't tell you precisely how to make your own slideshow, but now you know how to make static images come alive. ▲

**by Steve Smith**

## Infinite Loop

### 3rd Space Vest Used For Medical Diagnosis, Video Games

The "3rd Space" vest, designed as a medical device to allow doctors to prod patients' bodies via the Internet and know what they are virtually feeling, will soon be used by video gamers, as well. Originally, the vest was created as a way for doctors to examine isolated patients or prisoners. Although the medical version of this vest is still pending approval, a video game version, which delivers thumps to a player's body so they can feel when they've been shot, hit, or punched, should be available now.

www.physorg.com/news112024703.html

# Warm Up To Penguins

## The Down & Dirty Details Of Linux Network Configuration, Part III

For the last two months, we've been looking at the networking tricks you can do from the command line. In our last installment, it's time to see how your network is configured when you boot your system, talk about DHCP, and discuss wireless networking.

Obviously, you don't need to manually configure your network when Linux boots. It happens as a natural part of the boot process. Here are all the details. There may be minor differences on other distros, but you'll be getting the "truth according to Ubuntu."

The first thing you need to be familiar with is what happens when Linux boots. Without getting into all the messy details about Grub, LILO, and run levels, the simple version of the story is that at some point in the boot, a script in /etc/init.d is run. This script, appropriately enough, is called "networking." There's not much in there, apart from the normal scaffolding needed by all init.d scripts. (They need to be able to respond to start, stop, and restart requests, which requires some shell scripting to handle.)

In fact, all the script really does is run the ifup command. In this case, ifup means "bring up an interface." The version in the networking script says "ifup –a," which means "bring up all interfaces." But what do we mean by "all"?

The answer to that question lies a few directory levels over, in /etc/network. There is a file there labeled "interfaces," and it has the configuration information for all the network interfaces that should automatically come up during boot. Here's a sample output:

```
auto lo
iface lo inet loopback

iface eth0 inet static
address 192.168.1.220
netmask 255.255.255.0
gateway 192.168.1.1
auto eth0
```

What does this mean? The first two lines tell ifup to automatically bring up the loopback interface (the one located at 127.0.0.1). The next four lines tell the system to create a static IP address on the eth0 interface, at the given local address, netmask, and gateway through the given IP address. The last line instructs the script to bring up the eth0 interface automatically (when the –a option is used with ifup). Without the auto command, you'll need to bring up the interface manually.

### The Dynamic Duo

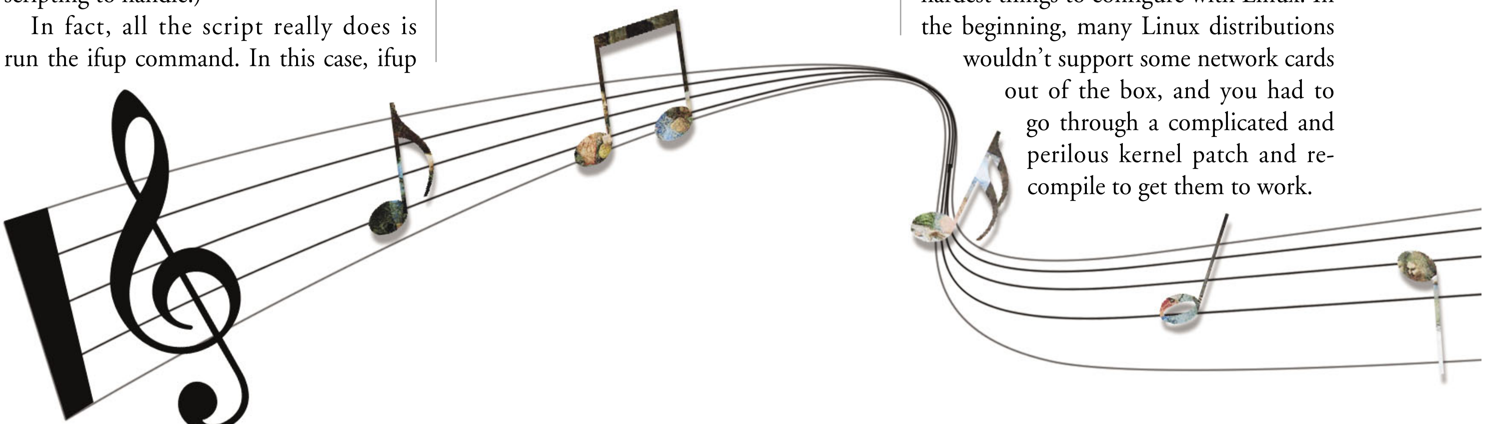
The other method of configuring an interface, DHCP, has to keep a process running because a DHCP lease needs to be renewed periodically. To let the networking script start up the DHCP process, you need to change the network configuration file. If you have a system with an /etc/network/interfaces file, you'd change the entry to "iface eth0 inet dhcp." Alternatively, if your network configuration is in /etc/sysconfig/network-scripts, you'd add a line that read "BOOTPROTO=dhcp."

If you have an interface that you want to configure with DHCP for one-time use (for example, if you have a laptop and you're using it at a company you're visiting), you can start DHCP from the command line. If you are trying to run DHCP on the device eth0, you merely have to type (as root, or using sudo) **dhclient eth0**.

You can use dhclient without any arguments; in this case, it looks at the file /etc/dhclient.conf for advice. This file can be very simple (or even empty), or it can be quite complex, in the case of some of the more elaborate DHCP configurations of some corporations. For any system that will be regularly using DHCP, just modify the network script and let the network startup take care of the details.

### The How & Why Of Wi-Fi

Historically, Wi-Fi has been one of the hardest things to configure with Linux. In the beginning, many Linux distributions wouldn't support some network cards out of the box, and you had to go through a complicated and perilous kernel patch and recompile to get them to work.



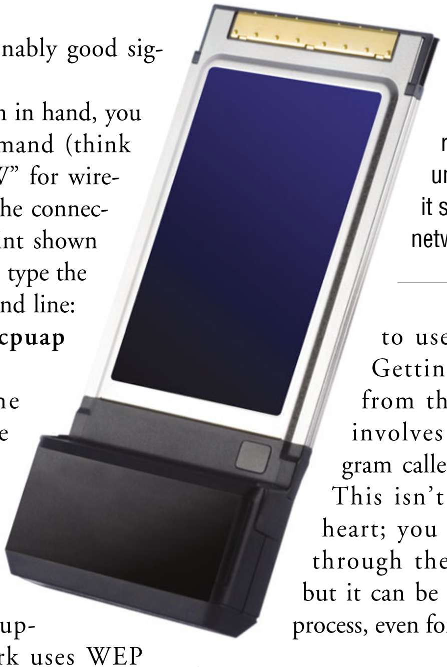
Recently, support for the most common Wi-Fi cards and chipsets are built into the kernel. You still need to configure it to get a successful connection, however. And if there's one place we recommend using the GUI configuration, it would be for Wi-Fi. Distributions such as Ubuntu ship with slick Wi-Fi tools that rival those found on Windows. They will scan for available hotspots, handle WEP and WPA keys, and generally keep the details out of your hair.

If you can't get to the GUI, you can still configure your wireless connection, but it's going to be painful. To begin, you'll want to find out what networks are available. You'll want to use the iwlist command. If your wireless card is on ath0, you can get a list of all the access points in the area by typing (as root) **iwlist ath0 scan**. The output will look something like this:

```
ath0 Scan completed :
 Cell 01 - Address: 00:12:17:46:E6:AF
   ESSID:"cpuap"
   Protocol:IEEE 802.11bg
   Mode:Master
   Channel:1
   Encryption key:off
   Bit Rate:1 Mb/s
   Bit Rate:2 Mb/s
   Bit Rate:5.5 Mb/s
   Bit Rate:6 Mb/s
   Bit Rate:9 Mb/s
   Bit Rate:11 Mb/s
   Bit Rate:12 Mb/s
   Bit Rate:18 Mb/s
   Bit Rate:24 Mb/s
   Bit Rate:36 Mb/s
   Bit Rate:48 Mb/s
   Bit Rate:54 Mb/s
   Quality=82/100 Signal level=-48 dBm
    Extra: Last beacon: 36ms ago
```

In this case, we can see a single access point in range, with the ESSID of "cpuap," available on channel 1 with no encryption and a reasonably good signal strength.

With this information in hand, you use the iwconfig command (think ifconfig, but with a "W" for wireless) to actually set up the connection. For the access point shown in the previous example, type the following in the command line: **iwconfig ath0 essid cpuap channel 1**.



This will make the ath0 interface available for connection, but you'll still need to use ifconfig to set up the actual network details (and possibly dhclient for DHCP support). If your network uses WEP encryption, you would need to add more information, making the command "iwconfig ath0 essid cpuap channel 1 key 23F0-332A-2341-563B," assuming that 23F0-332A-2341-563B was the WEP password in hex format. You can't use WEP passphrases with iwconfig.

Suppose that you are using WPA encryption instead of WEP. At this point, unless you have a lot of time on your hands and want to become an expert of wireless security protocols, you *really* want to use the GUI tools. Getting WPA to work from the command line involves invoking a program called wpa_supplicant. This isn't for the faint of heart; you can set up WPA through the command line, but it can be a time-consuming process, even for seasoned vets.

If you plan to use your laptop at a hotspot or wireless router that you're unfamiliar with, play it safe and use the GUI networking tools.

### A Farewell To Networking

This ends our three-month odyssey to the mysterious land of Linux command line networking. You may not be ready to become a Linux network administrator, but if your GUI ever goes south on you, you may have some hope of getting your network working again. And even if you never leave the comfort of a GUI, it never hurts to know what's happening behind the scenes. ▲

**by James Turner**

Infinite Loop

## The Real Da Vinci Code

Granted, this latest discovery isn't quite of the same magnitude as unearthing a deep-rooted, far-reaching conspiracy, but it might be more believable. Italian musician Giovanni Maria Pala believes that he has uncovered a hidden soundtrack in Leonardo da Vinci's "The Last Supper." Further study of the painting also reveals a secret message—"Michelangelo stinks"—as well as da Vinci's prediction for Super Bowl XLV.

news.yahoo.com/s/ap/20071109/ap_on_re_eu/da_vinci_code by Mike Magee

# Time To Take The New PC Plunge

The DRAM manufacturers have had a terrible year, and none of them can see any light at the end of what seems to be a very long tunnel.

Their misfortunes are, at least in the short term, good news for us all; buying memory is, er, cheap as chips, and if you haven't taken advantage of the glut yet, now's a good time to beef up your desktop or notebook.

I've a bread-and-butter machine on which I do most of my day-to-day work that came with 1GB of memory. It still runs Windows XP, which can support up to 3GB, so I bunged an extra 2GB in there the other day and it has made quite a difference to overall performance.

But that's probably it for my home machine. The system uses a now very ancient and defunct 3GHz Pentium 4 CPU. I don't use my self-built Pentium M desktop anymore. It was a very pleasing alternative to the Pentium 4, but the case and the motherboard I used weren't suitable for the CD-RW drives, extra drives, and extra USB ports I needed.

After making a living writing about PCs for an astonishing 20 years, it's time that I upgrade my machine and help keep the industry going. But what to buy? My advice in the past has always been to buy the best you can afford and to not skimp on price but go for maximum performance.

If you're comfortable with building your own machine, you can do that and you will save money, but sourcing the different bits and pieces, while it's interesting, is a different game altogether.

It's all a little bit complicated by the operating system. Unless you were a real pioneer and were prepared to dabble with obscure operating systems, Microsoft Windows was the clear choice not so terribly long ago. That's no longer true. You could buy a pretty lean system and rely on Google or Glide apps, but even Picasa Googlish software doesn't help you if you've a VCR, a digital camera, and years of data and you don't have the time to organise all those files.

*Mike Magee is an industry veteran. He cut his teeth on ancient products like the Dragon and the Japanese PC platforms long before the IBM-PC won. He worked for a corporate reseller in the mid-'80s and saw the Compaq 386 sandwich box and every GUI known to humankind. Mike decided that the way to go was the Interweb around 1994 after editing PC mags in the late '80s and '90s. A co-founder of* The Register*, Mike started the chip-driven INQUIRER (www.theinquirer.net) in 2001. He has contacts from top to bottom in the business, spanning the entire chain, who help him root out interesting rumours and speculation.*

It's a real nuisance having to think about operating systems, because most people, unless they're addicted to technology for technology's sake, work and play with apps and games.

What about CPUs? It looks like AMD has finally started to fight back against what it regards as the Evil Empire; by the time you read this, its Phenom microprocessor will probably be available.

However, that choice matters less and less. The CPU is beginning to be just another component, and the two firms are finding it harder than ever to play the "mine's bigger than yours" game.

So, instead I will be concentrating on the amount of storage space I have, the number of peripherals that I can attach to a PC, and the memory that's installed. It's time to dispense with my trusty old Iiyama CRT monitor and finally buy an LCD monitor of a size, resolution, and speed that will come near to matching its specs. Wonder if I'll find the strength, in my dotage, to be able to lift the monitor off the desk?

For a graphics card, I will probably plump for a medium-priced model, or perhaps even a high-end one if the price of those falls sufficiently over the next few months. A few of my peripherals, like my sound card, will have to be junked because they will have incompatible edge connectors for new generations of motherboards.

What I'm really dreading, however, is having to reinstall the dozens of applications that are sitting on the big, mirrored hard drives I have on these machines. Will I have to move to Vista? There may be a way round this. According to the WinXP EULA on the Microsoft site, the OS is limited to one machine. So even if I buy a machine with a hard drive, it seems that it's legal to pull out the WinXP boot drive from this old machine and bung it in a new one, maybe using the new hard drive as a mirror. ▲

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**Send rumours to "Mad Mike" Magee at mike@cpumag.com**

# Wagging The Dog

by Rahul Sood

# Where's The Soul?

I recently traveled to California for some meetings, and as is my wont, I rented a car in San Francisco and drove to Cupertino. I was pleased to hear that the car was an Impala when I checked in at the Hertz counter because I am currently in the process of restoring a 1964 Impala SS Convertible. As I walked down the aisle looking for the Impala, I wasn't sure what to expect, but I certainly didn't expect the uninspired piece of crap I found waiting for me.

As I sat in the car, I began to see a correlation between the soulless American cars of today and the potential reasons why American car manufacturers are in trouble. I, like many, appreciate cars with "soul," and as most would agree, almost every 1960s-ish American car had soul. Take the 1965 Lincoln Continental Convertible with suicide doors, for example. This car was a thing of beauty, perhaps way ahead of its time. Of course, the 1960-plus Corvettes and the Mustang pony cars would make anyone smile. These are some serious cars with an incredible heritage, so what happened to the soul? Where did it go?

*Rahul Sood's love for computers started at the young age of 11. Much to the shock and dismay of his parents, he ripped apart his brand-new Apple //c and painted it red before turning it on. His parents' dreams of having a doctor for a son were shattered when college drop-out Rahul founded what is now one of the most respected high-end computer companies in the world, Voodoo Computers.*

At the risk of making Mark Solomon (our lead industrial designer and the guy who designed Blackbird) puke, I'm about to tell the story that I've been telling a lot at HP for the last little while. Also, a warning to longtime *CPU* readers: I touched on this topic (albeit not nearly as much detail) in my very first *CPU* column back in 2005. As you can probably tell, it has a deep meaning for me and, I feel, directly correlates to our industry.

Back in the 1960s, Henry Ford II recognized a correlation between winning races and selling cars. He led the charge with the help of Lee Iacocca, then president of Ford and the father of the pony car, to help sell more Mustangs. It was Lee Iacocca who said, "Race on Sunday, sell on Monday."

Henry Ford II asked Lee Iacocca to find out who the best race car builder was, and of course at the time it was Ferrari. They then set out to buy Ferrari, not knowing that Ferrari had already approached Ford by way of a dealership in Germany in order to figure out a way that they might partner. Long story short, Enzo Ferrari needed Ford just as much as Ford needed Ferrari.

They eventually worked out a deal where Ford would buy all of Ferrari for $18 million dollars, and Ferrari would run the races while Ford would handle production cars. Believe it or not, both Enzo and Lee were sketching "Ford Ferrari" logos for production sports cars and "Ferrari Ford" logos for race cars. The goal: to create the ultimate race car, win the 24 Hours of Le Mans, and sell more Mustangs.

The Indianapolis 500 is renowned as the world's biggest single sporting event, and the Monaco Grand Prix is also very famous and prestigious, but the 24 hours of Le Mans stands apart as the most revered of all motor races. Le Mans has hosted races since before the turn of the century and was the site of the first officially recognized French Grand Prix in 1906.

Well, it was all good until it became clear that Enzo wanted control of Indianapolis, as well, and Ford would have none of it. In the end, the relationship quickly dissolved and Enzo killed the deal, enraging Henry Ford in the process. Ford was so incensed that he pledged to crush Ferrari by spending as much as it took to destroy the company at Le Mans.

Ford charged Iacocca with finding another racing partner. Iacocca made a deal with Lola Cars and also hired a consultant named Carol Shelby to help create what was then the most talked-about race car in American history, the Ford GT40.

It took a few years to get it right, but in 1966, there was jubilation in Dearborn as GT40s swept the first three places at Le Mans against the best Europe had to offer. Ford had accomplished something no American company had ever done before.

Ford repeated in '67, '68, and '69 when lighter, more powerful GT40 Mark IVs again beat the Ferraris and Porsches at Le Mans. The GT40's lap record stood until 1970 and its speed and distance records until '71.

The bottom line is Ford was successful and sold more Mustangs during that period than expected. But after proving it could be done, the company stopped. Japanese and German car companies entered the market, gas mileage became an issue, costs were cut, parts were shared, and fast-forward to today, where by and large cars have all but lost their soul. Many American cars look the same, and most models are created to fit certain "price bands" rather than cater to a specific customer. Sound at all like the PC market? ▲

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**Send your opinions to this opinionated guy at rahul@cpumag.com**

CPU

# Look For *CPU* At These LAN Parties Across The Nation!

12.01.07
Intel LanFest: Sacramento II, Sacramento, CA
www.sac-lan.com

12.14.07
East Coast LAN, Chesapeake, VA
www.eastcoastlan.com

12.15.07
Ascendancy Gaming Winter Wonder LAN 2007, San Francisco, CA
www.ascendancygaming.com

Exile Computer Gaming, Albany, NY
www.exilecomputergaming.com

Xodus, Rochester, NY
www.egslan.com

12.30.07
FRAGfinity Winter LAN, Oxford, IA
www.fragfinity.com

12.31.07
Chris' LAN Fest - Graduate Style!, Warner Robins, GA
cealerslanfest.com

01.05.08
Whempy's LAN Party, Columbus, OH
www.whempys.com

01.26.08
Carolina Games Summit, Goldsboro, NC
www.carolinagamessummit.com

PeaceLoveandRockets, Arlington, TX
www.peaceloveandrockets.org

02.16.08
AsylumLAN, Evansville, IN
asylumlan.com/lanparty

2.22.2008
Netwar 15.0, Omaha, NE
www.netwar.org

02.23.08
Appalachian State University Gaming Club, Boone, NC
www.gaming.appstate.edu

03.01.08
Iron Storm 7, Castle Shannon, PA
www.pittco.org

03.07.08
Digital Overload, Providence, RI
www.digital-overload.com

04.11.08
LAN OC, Ohio City, OH
www.lanoc.org

04.19.08
Appalachian State University Gaming Club, Boone, NC
www.gaming.appstate.edu

Spring 2008
Xodus, Rochester, NY
www.egslan.com

05.01.08
NVGASUPERCON, Albuquerque, NM
www.nvgasupercon.com

05.26.08
NEXLAN, Spokane, WA
www.nexgenconsulting.net

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# Technically Speaking

## An Interview With Brad Wardell, CEO Of Stardock Systems

Brad Wardell is the founder and CEO of Stardock Systems, with a developer specialty in AI. Stardock Systems' game Galactic Civilizations II was a bestseller when it was released two years ago.

**by Barry Brenesal**

**CPU:** From roughly 1995 to 2001, big business embraced the Web, then pulled away when so many companies failed online after the dot-com bubble burst. Current conventional wisdom is that it's nearly impossible for a business to be successful on the Web alone, at least not if your business is any larger than a very tiny operation with minimal expenses.

**Wardell:** The reason for the dot-com panic was that not enough people were yet on the Internet. There was a disconnect between the amount being spent and the amount that could potentially be made. For example, in those days we did not have Google ads. So people were paying $20 or $30 per thousand impressions, when there simply wasn't the kind of presence online to justify these rates. It was like someone going out at the beginning of the car industry and building 100 million automobiles, when there just weren't the buyers at that point. Whereas what Stardock has done is to grow along with the Web. As more and more people entered it, we were able to expand our product line on the 'Net.

**CPU:** When did you start the company?

**Wardell:** I started Stardock back in college because I couldn't get a real job. I was trying to pay my way, so I became an OS/2 developer for IBM.

**CPU:** Before we get much further along, why did you think you couldn't get a "real job?"

**Wardell:** Well, because I kept being rejected. I was working multiple small-time jobs at once, and my grade point average wasn't that great: 2.5 or 2.6. So when I sent out resumes to Texas Instruments, Raytheon, and similar big companies, they would either dismiss me because of my grade point average or because I went to a smaller school—Western Michigan University.

**CPU:** But what actually led you to start this kind of a business?

**Wardell:** When OS/2 came along, I saw a pretty big opportunity. I've always been into computer AI. I wanted to produce a 32-bit game that was way better than anything that had previously come out, and the only way I could do that was if the title could multitask easily within itself.

That was why I decided to make an OS/2 game. As for the rest, OS/2 was so ugly, so unfriendly to use, that I figured if we could start making programs that made the platform more attractive and easier to use, a lot of people would probably buy them.

**CPU:** If you don't mind me asking, what kind of capital did you have for your startup costs?

**Wardell:** No capital. I was driving a Chevette. I worked on my products by myself and then eventually found other people who were willing to work based on a royalties system. If it took off, they would get a significant piece of whatever was brought in, but if it failed, they would get nothing. Fortunately it took off, and they did well. But basically it was just me for the first two years. Then, once we finished Object Desktop and Galactic Civilizations for OS/2, the money was sufficient to bring on office people and a tech support person. From there, it built to where I was able to hire developers and artists.

Eventually, though, OS/2 died. When it collapsed, we had to move to Windows. It was very difficult at the time, because the OS/2 market basically disintegrated when Windows NT 4.0 came out at the end of 1996. Almost every OS/2 user in our merchant demographics switched within six months. Really! Of course, you can't switch your software over within six months, and we had to start over from scratch.

**CPU:** You must have had a lot of retuning costs at that point.

**Wardell:** We did. We had to lay off most of our people. We went from being a multimillion dollar company in the mid-'90s down to making just $200,000 a year in 1998.

**CPU:** Did you know the OS/2 crash was coming? Could you see it in advance?

**Wardell:** We did not understand how abrupt it would be. We were expecting it to occur over the course of two to three years in a gradual decline, not an abrubt disappearance.

**CPU:** But your company today is more financially robust than it ever was.

**Wardell:** Oh, absolutely. We're an "eight-digit" company at this point. We have about 50 employees at this point, counting full-time contractors.

Multiple phases have affected Stardock's growth. For the first few years, after we got into Windows, we got most of our revenues from the desktop enhancements, because Windows, like OS/2, is historically an ugly-looking operating system. You had to use it exactly as Redmond decided it would look. We had a lot of help selling our product from word-of-mouth on the Internet. Then e-commerce really came of age. I do feel we were a pioneer in that area. People could pay money for something and download it at the same time. Nowadays we take it for granted, but back in the late '90s it was something new.

**CPU:** Also new was your Stardock Central interface. It still impresses me as one of the best in the business for its logically defined progression through easy-to-read screens that get you wherever you need to go quickly. It also offers automatic updates for just the software you run whenever you enter the site. This is all in stark contrast to the Web sites of many other companies. Those are often filled with superfluous pictures and lengthy branching menus that are counterintuitive. Who designed Stardock Central?

**Wardell:** It was our VP of Operations, Angela Marshall. Before that, we had Component Manager, which was something I largely designed. The idea behind it was that you buy our products normally through the Web. Then, once you had them, you used Component Manager to keep the products up-to-date. But Marshall's concept was to take it one step further. Why just have a place to download and update when you could also keep people informed about what's happening and provide forums? That made a significant difference in the user experience.

How many times have you seen some neat shareware title but not purchased it because you know that down the line in six months you're going to lose that serial number, or the program, or you're going to reinstall your operating system? Then the only way you can reacquire the product is to buy it again. We looked at that as a major obstacle that had to be overcome. People have to know that when they buy something from us, even if they blow up their computers, that with a couple of clicks they can have it all again.

> The reason for the dot-com panic was that not enough people were yet on the Internet.
> —Brad Wardell

**CPU:** You also maintain a very active relationship with your user base, both in the applications and game forums. You further encourage users to develop mods: code that can be used to modify your games and artwork for your interface replacement applications.

**Wardell:** I've always just looked upon myself as a glorified modder. Over the years, I've looked at the number of programs I've used, that I've wished I could have contributed to. I know other people feel the same way I do. If we can let them interact with us, then we together can make a much cooler thing.

**CPU:** Branding is clearly in your favor. Where do you see this going next?

**Wardell:** When you're running Windows Vista, you're running all kinds of stuff that you will probably never use, because it's a one-size-fits-all solution. You've got the tablet PC drivers running—even if you don't have a tablet. You've got touchscreen drivers even if you don't have a touchscreen. I think the direction the industry's going to take is for PC vendors and their buyers to have their interface screens out of the box be customer-tailored to their particular needs.

**CPU:** You've mentioned how the product areas you developed in OS/2—the games, the interface replacement utilities—pretty much carried straight across onto Windows. Have you considered taking your company into other software genres?

**Wardell:** I wouldn't consider expanding much beyond where we are now until the average Windows user knows what it is. But I think the next big thing will be information environments. I think that in three or four years, most people are going to have access to at least two computers. It's not going to be a matter of having a computer at work, or at home, but "I have a computer at work, one at home, my kid has a computer, I also have a laptop, etc." So the next big thing is software that caters to this, accessing these computers together as a single source. We need to make software that allows people to utilize all these resources.

We're just starting to do this. We've got a program called Multiplicity that allows you to use the multiple computers you have available as one computer, literally copying and pasting back and forth. That makes my productivity a lot higher. I don't want to have to wonder where information is that I need; I just want to get my data and not think about where it is.

**CPU:** A number of years ago, I interviewed Richard Garriott, shortly after the publication of his ground-breaking Ultima VI. We were discussing the greatly expanded timeframe for development and how games had started falling behind release schedules by a year or more. I asked him, half-jokingly, whether he'd ever considered project management software. There was a lengthy pause followed by a frigid "No."

Now you've grown much larger over the years, and your products, more sophisticated. How have you planned for increasing complexity in the development cycle?

**Wardell:** Think how Object Desktop could have been done, as a monolithic application: one giant interface with all the content in it. Imagine trying to manage that. Then you have all those huge cost overruns and all that pain involved. We tend to break our interface products into components. Each component can be done by two to five people. Games are a little different, but even on the game side, they don't involve more than five to six developers at any one time. One of the big three publishers told us that there was no way we made Galactic Civilizations II with a team of six people. But that's the way we work.

The way we do it is by developing tools that allow fewer people to do a heck of a lot more. For example, anyone who has done game development knows how much of a pain the UI can be. But on Galactic Civilizations II, one person was able to do the art and implementation using DesktopX, one of our own products. Similarly, we make editors for all kinds of things, rather than figure out how to hardcode things.

**CPU:** But you still have a history of getting out software in a timely fashion, and that contrasts with a fair amount of the industry. Do you do no project planning at all?

**Wardell:** Typically in a large company, what happens is a project manager makes a schedule, then sends it out, and then everybody complains about it, but that's just how it is. At Stardock, it works from the bottom up. The people who are making the stuff are the ones who tell us how long everything takes. Then we add it up, and that's how we come up with our schedule.

**CPU:** So it's not that you ignore project management, so much that you have a lot of the timeline structure generated by the people who are actually doing the work.

**Wardell:** Exactly. It isn't me going into Microsoft Project and telling everybody how long everything is going to take. At the beginning of the project we decide what the main goals are. We then give out assignments to everyone, and they tell us how long it should take them. They give this back to me, and then I start building the schedule.

The other thing we do is have open betas. The people who pre-order are then allowed to beta test a game openly for six months before release, sometimes up to a year. So by the time it's released, it's had as long as a year of full disclosure, public beta testing. CPU

> We went from being a multimillion dollar company in the mid-'90s down to making just $200,000 a year in 1998.
> —Brad Wardell

by Kristina Spencer

# Under Development

## A Peek At What's Brewing In The Laboratory

### Touch The Screen On Both Sides Now

Multitouch technology is receiving a lot of press these days. With Apple's iPhone blazing the trail, devices that let users go from simply using one finger to press a button or launch a program to using two or more fingers to drag, rotate, and resize onscreen objects may soon send user interfaces that utilize a mouse or other pointing device the way of the dodo.

But a problem arises when the consumer's desire for ever smaller devices comes into direct conflict with his desire for a cool multitouch screen interface. The smaller the screen, the more of it your fingers cover up during use. And because your fingers are finger-sized—not pixel-sized—it can be difficult to touch the screen precisely where a program is expecting input.

Researchers at Microsoft and MERL (Mitsubishi Electric Research Lab) have developed a possible solution: LucidTouch, a two-sided touchscreen device that uses the *back* of the screen for multitouch input while overlaying a semitransparent image of a user's fingers so that he can see where he's touching the screen as he interacts with a program.

"It's often said that direct-touch is more 'natural' than indirect input devices," explains MERL researcher Daniel Wigdor. "This may be true, but this naturalness comes at the high cost of occlusion and lack of precision.

Pseudo-transparency is a lightweight, intuitive way of recouping some of that cost while still maintaining the affordances of a direct-touch device."

The team MacGyvered a prototype of the system by gluing a multitouch pad to the back of a commercial single-input touchscreen. Then, in order to capture an image of a user's hands, they attached a Web cam to the back of the device using a long boom. Finally, software running on the computer to which the device was attached flipped the image and dropped out the background, creating the pseudo-transparent effect. In tests, users were able to type from behind on a split keyboard, browse a map to find a specific location, and drag and drop objects.

According to Microsoft researcher Patrick Baudisch, the next step in LucidTouch's development will be to replace the external Web cam with an integrated video-capture device that can sense the location of a user's fingers and create the pseudo-transparent effect. Some possibilities for achieving this include a capacitive array, LED sensors, or stereo cameras embedded in the device's body. ▲

An early design drawing of LucidTouch shows how a user will be able to utilize multitouch and interact with a program from behind the screen.

### Here Comes The Spider-Man . . . Suit

In last month's "Under Development," we joked that a new carbon nanocomposite material might be used to create X-ray glasses. It does seem that carbon nanotubes are being touted as the miracle material of the future, promising advances in chip technology, super-strong building materials, and clothing that can not only serve as body armor but also help humans climb walls, *a la* Spider-Man.

This time, the comic book reference is no joke. Nicola Pugno, a structural engineering professor at the Polytechnic University in Turin, Italy, has published a paper that outlines how carbon nanotubes could be used to create super-adhesive boots and gloves capable of supporting a human's weight.

The inspiration for Pugno's research came from the way that geckos and spiders are able to scamper up and down vertical surfaces, even very smooth surfaces such as glass, without slipping or sliding down. Geckos stick because they have thousands of tiny fibers on their feet that create adhesion through capillary action (due to a thin layer of water between their feet and the surface) and van der Waals force (a bond between close molecules). A spider climbing a web relies on a nano-interlocking of fibers.

In order to duplicate these adhesive effects on a human scale, Pugno theorizes that a material could be made from millions of carbon nanotubes woven into 1cm-thick threads. At the end of each thread, the nanotubes would fan out to provide millions of points of contact between the material and the surface, creating enough adhesive force to support the weight of a 150-pound man.

Although the suit is currently only a theory, Pugno hopes that a prototype could be developed from his calculations within 10 years. ▲

Using the gecko as inspiration, scientists hope to design boots and gloves that could allow humans to stick to and climb vertical surfaces.

## Photographic Mix & Match

Even with digital photography, we still take plenty of snapshots that "would have been perfect, if only . . ." If only that building wasn't in the way of the view. If only that obnoxious tourist wasn't posing next to that statue. If only there wasn't scaffolding covering the face of that beautiful cathedral. What if there was a way to convert those "if-onlies" into the perfect shots you intended?

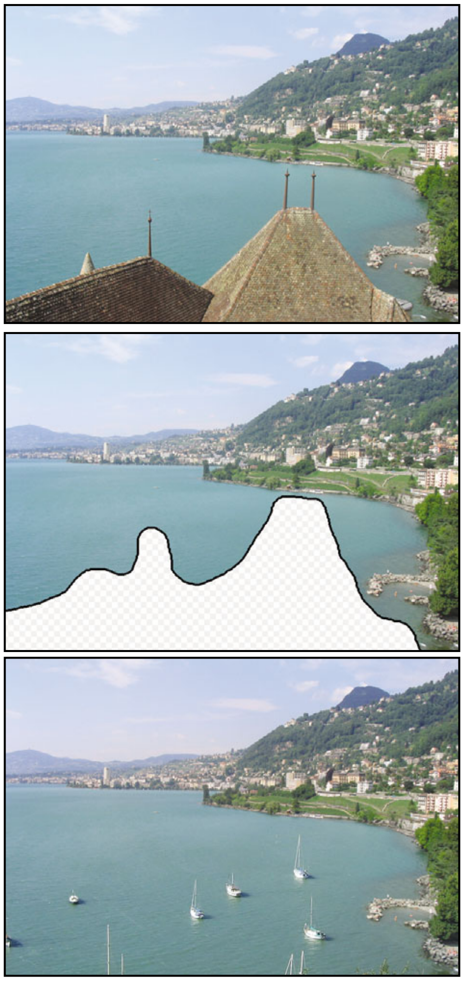
Two researchers at Carnegie Mellon have developed a program that will help do just that. The software, called Scene Completion, uses a novel approach to image retouching. Unlike systems which attempt to reconstruct missing or removed image data extrapolating from other parts of the same photo, Scene Completion uses other photos—sometimes completely unrelated to the subject matter of the photo being retouched—to find an appropriate and believable patch.

In order to accomplish this, the software sorts through millions of photos (in this case, using over 2 million Flickr photos) as its data set and applies a "gist descriptor" algorithm (developed at MIT) to find photos that share similar general properties of the photo needing work: shapes, colors, geographical features, and textures. From that subset, the software looks for specific pieces to fill in the needed data, trying to match the colors and border well enough that with blending of the edges, the photos look almost as good as the real thing.

The program does have limitations. Some photos are more difficult to match than others, explains James Hays, the Carnegie Mellon computer science graduate student who developed the software. "Scenes that are very rare (an unusual focal length, orientation, camera height, subject matter, coloring, etc.) have fewer good scene matches. It's harder to fill holes in those rare scenes since it's harder to find similar scenes to take content from."

The other major issue is the large number of photos needed to create an accurate subset from which to cull the most realistic photo patch, and the potential copyright violations if public photo repositories are used. Hays believes that using only the 75 million photos on Flickr, which are licensed to be modifiable under Creative Commons, provides a large enough sample size, but the question of how many of those images are of high enough quality to be useful remains.

There are currently no plans to commercialize the Scene Completion system, though the team would like to release it to the public once some speed issues have been addressed, perhaps as an online version. Currently the database size—half a terabyte of images—prohibits distribution in any other manner. ▲



Using a "gist descriptor" algorithm, the roof of a building in the original photos is removed and replaced with sailboats from an entirely unrelated image using the Scene Completion software.

## Memory Goes 3D

The next major advance in memory chips could come by working in the third dimension. Stuart Parkin and his colleagues in the IBM Almaden Research Center's (www.almaden.ibm.com) SpinAps group are working to develop a new type of memory that could store significantly more data in the same physical space (as well as access that data at much faster speeds) than current magnetic and solid-state memory devices.

The potentially revolutionary technology, dubbed "racetrack memory," utilizes millions of nanowire loops positioned vertically around the edges of a silicon chip, each of which could store between 10 and 100 times more data than today's flash memory. Electric current moves tiny magnets up and down the wires at speeds over 100 meters per second, allowing read/write speeds as fast as a nanosecond. This would overcome a major drawback of flash memory—its slow write speed.

The memory is in the early stages of development: Parkin has yet to build a prototype, although he has shown that the basic elements of this new type of memory are possible. Parkin's team still needs to reduce the amount of current necessary to move the information along the nanowire and research the possible interference between the closely-spaced nanowires to determine how densely they can be packed. If Parkin is able to solve these problems, it's possible that racetrack memory could make its move on the market in three to five years. ▲

# Q&A With Gary Elsasser

Gary Elsasser has been designing computers for 22 years and has worked on more than 50 notebook computer designs. He started out at age 16 while still in high school. He spent 14 years designing notebook computers at Toshiba. Now 38, he is senior vice president of products for Gateway. He became part of Gateway when the company acquired his own firm, eMachines, a few years ago. Now Acer has agreed to acquire Gateway. But Elsasser has had his head down coming up with products such as the iMac-like Gateway One and a 30-inch display with a video processor that can do a trillion operations a second.

Q **So you've got a couple of interesting products in the Gateway One all-in-one computer and the 30-inch Gateway monitor with the video processor. With the monitor, it's interesting to see a different approach.**

GE I try to tell people that with the merger of Gateway and eMachines, we had a lot of work to do. Gateway grew so fast that it was having trouble sustaining its own weight. I felt I was reaching behind me and working on the engine of the company to keep it running. At the same time, the competition was building out innovative products. Now in the past year, the company has been turning out innovative products like the Gateway of the past. Now in the holiday season, I actually feel the labor of that focus is starting to show.

Q **Steve Jobs said at the last iMac introduction they believe it's an all-in-one world. They showed a Dell model with lots of wires coming out of it. Has that affected your thinking?**

GE We ran a bunch of focus groups. We addressed how we wanted to bring Gateway back to where we want to be. We do a lot of mini towers. But how do we capture minds and spirits of those we aren't getting to now? Some key things people said: "I'm busy. I don't have time for complexity or things that appear to be complex. Make it simpler." That was one thing we took to heart. The second was, "My life is complicated, and my space is cluttered. I've got wires everywhere. Can you help me? Make my life simpler and less cluttered." Gateway One focused on how to get rid of the wires so you can have a single usable product on your desk. We have four main standards of Wi-Fi. We support both 2.4GHz and 5GHz. You can get a 5GHz access point, set the Gateway One at 5GHz, and you will have fantastic access. We did this for a reason. We just want it to work in your home. If the access point is upstairs and one room away, it still works. That's one less tech support call. That's a customer that is happy and will buy the next customer machine. That's why we did it.

Q **Some people will say you are copying the iMacs.**

GE We are on our 12th all-in-one PC. We've been doing it since 1999. It doesn't sound like we're copying. You can take them apart in seconds. You can swap out a power supply in 12 seconds. That's what they are designed for. Now we're a fully focused consumer company like we were when we started.

Q **What sort of future for the PC are you looking forward to?**

GE My crystal ball. I see wonderful things with mobile. There are tradeoffs if you want to do gaming or creative professional work. You are not yet getting optical drives you want with Blu-ray or HD DVD in mobile. You can't quite get the performance you want and battery life when you need it. On desktops, we have different ways to take it. I'm extremely happy with Gateway One. I believe we have a lot of room to grow in that area. I believe every small-form factor desktop has been a failure. There is a formula to make that work. The traditional PC is not going away.

Q **What do you think of flash-based laptops or hybrid hard drives?**

GE In our internal work, we see those technologies are slower. They take up more battery life because the algorithms are not balanced properly between hard drives and flash. I see a future where it will work. It's not working well now. It's marketing hype now. It's not beneficial to the customer. Maybe six months' more maturity. There will be adjustments in the operating system, driver tweaks. Right now it's not working. ▲

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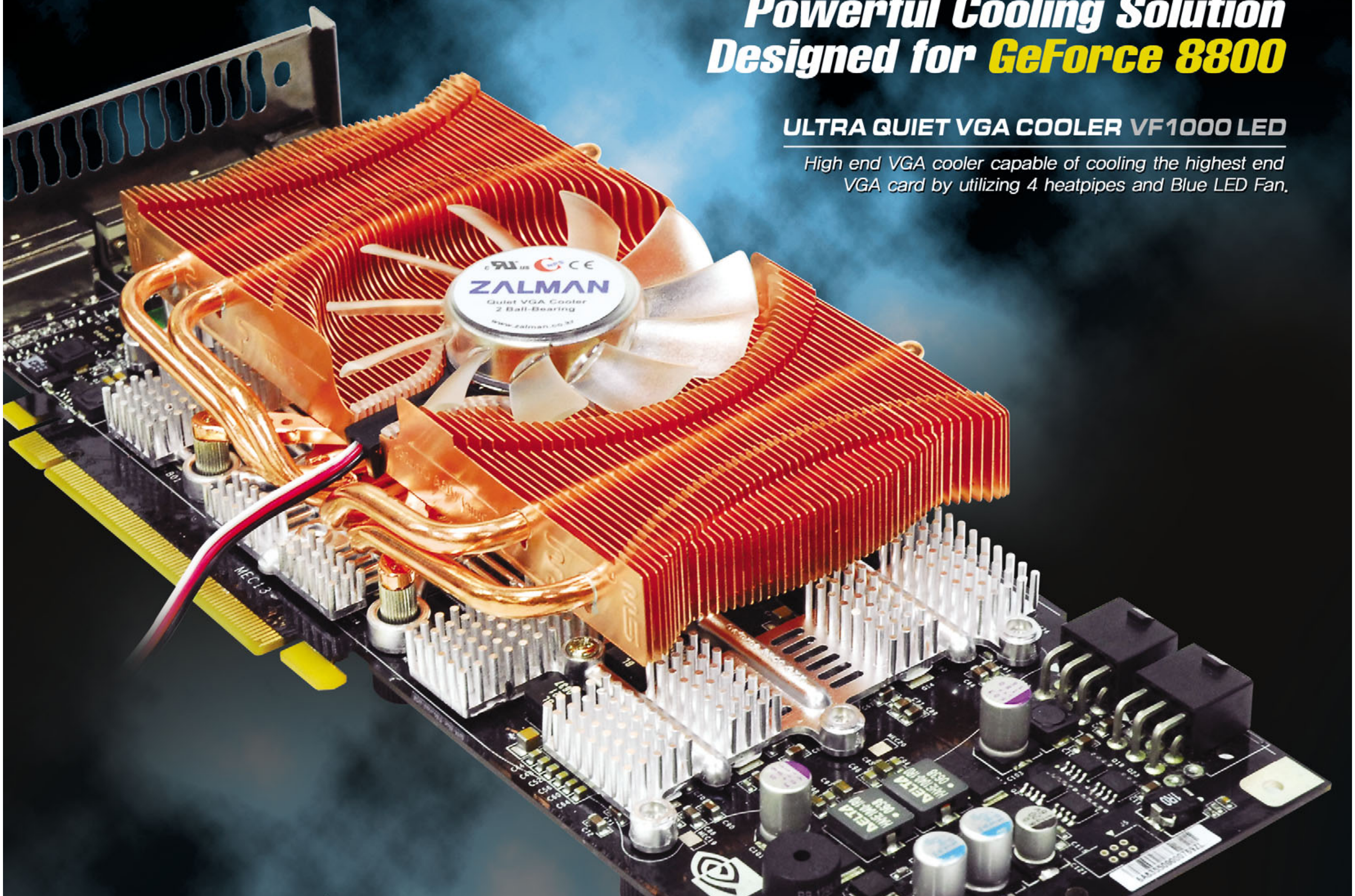

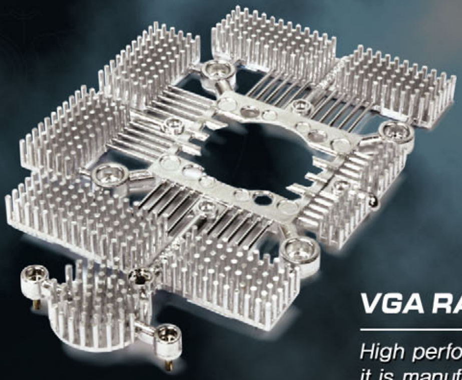

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